

The selected remedy components for the equalization lagoon, groundwater, and soils, sediments, and surface water will adequately protect human health and the environment. Excavation and off-site disposal of source material in the equalization lagoon will protect human health and the environment via the removal of source material from the Site, eliminating on-site residual risk. The selected groundwater remedy will protect human health and the environment via active, in-situ treatment of the groundwater via Enhanced Reductive Dechlorination (ERD). ERD is expected to significantly reduce concentrations of chlorinated VOCs in groundwater at the Site. Exposure to mercury contamination in groundwater will be eliminated by connecting affected residential well users to public water supply. In addition, short-term risks will be addressed via the provision of bottled water. The selected remedy for soils, sediments, hydric soils and surface water will protect human health and the environment via the removal of impacted materials from the Site, significantly reducing residual risks to ecological receptors. This remedy will also provide for full wetland restoration. Implementation of all components of the Selected Remedy will reduce human exposure levels to an acceptable risk range of 10^{-4} to 10^{-6} for carcinogenic risk and below the HI of 1 for non-carcinogens. No unacceptable short-term risks or cross-media impacts will result from implementation of the Selected Remedy.

Compliance with Applicable or Relevant and Appropriate Requirements

The Federal and State ARARs and the "To Be Considered" requirements relevant to the Site and the Selected Remedy are listed in Tables RD-2 and RD-3. The Selected Remedy will comply with provisions of the ARARs listed in Tables RD-2 and RD-3 per the relevant Comments.

Cost-Effectiveness

In the lead agency's judgment, the Selected Remedy is cost-effective and represents a reasonable value for the money to be spent. A cost-effective remedy in the Superfund program is one whose "costs are proportional to its overall effectiveness" (NCP § 300.430(f)(1)(ii)(D)). The "overall effectiveness" of a remedial alternative is determined by evaluating the following three of the five balancing criteria used in the detailed analysis of alternatives: (1) long-term effectiveness and permanence; (2) reduction in toxicity, mobility and volume through treatment; and (3) short-term effectiveness. Overall effectiveness is then compared to cost to determine whether a remedy is cost-effective (NCP § 300.430(f)(1)(ii)(D)).

For determination of cost-effectiveness, a cost-effectiveness matrix was utilized. The relationship of the overall effectiveness of the Selected Remedy components was determined to be proportional to its costs and hence the Selected Remedy is cost-effective and represents a reasonable value for the money to be spent.

Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery Technologies to the Maximum Extent Practicable (MEP))

EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Site. Of the alternatives that are protective of human health and the environment, and comply with ARARs, EPA has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment and bias against off-site treatment and disposal, and considering State and community acceptance.

The Selected Remedy provides permanent solutions for all media and treatment for groundwater. It does not provide for treatment of wastes in the equalization lagoon or soils and sediments. For the equalization lagoon and sediments and hydric soils, excavation and off-site disposal is a permanent remedy that is easily implementable, cost-effective, and accepted by the State and community. Treatment will be required if removed materials are determined to be hazardous waste. For the groundwater remedy, ERD satisfies the preference for usage of alternative treatment technologies. ERD will provide long-term effectiveness and permanence, will reduce the toxicity, mobility, and volume of contaminants, is implementable, cost-effective, and accepted by the State and the community.

Preference for Treatment as a Principal Element

By utilizing treatment as a significant portion of the remedy (groundwater treatment through ERD), the statutory preference for remedies that employ treatment as a principal element is satisfied.

Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

PART 3 RESPONSIVENESS SUMMARY

The comment period for the Admiral Home Appliances Proposed Plan initially ran from August 23, 2005 to September 23, 2005. It was then extended through November 7, 2005. Several comments were provided verbally by three individuals at the August 25, 2005, Proposed Plan Public Meeting. One individual at the meeting submitted several written questions at the meeting. Two commenters mailed written comments during the comment period. The transcript of the Public Meeting has been placed in the Administrative Record for this Site. The comment period was extended 30 days based on a verbal comment made at the public meeting. It should be noted that EPA and SCDHEC staff conducted a question and answer session at the Proposed Plan Public Meeting after the formal presentation and public comments. The official transcript of the Proposed Plan

covers only the presentation and the formal public comments on the Proposed Plan. The following discussion provides EPA's response to all comments received. The individual who submitted written comments at the public meeting had three questions. The individual requested tissue sampling of fish at Willis Millpond. EPA's response is that tissue sampling was not performed and is not planned as part of the Superfund process at the Admiral Home Appliances Site. The COCs at the Admiral Site do not bioaccumulate in fish so sampling of the fish including tissue sampling was not performed. The ecological risk assessment did perform a biota survey of benthic organisms at Willis Millpond as well as toxicity testing. Tissue sampling may be requested from another agency with direct responsibility for fish and wildlife. The South Carolina Fish and Wildlife Service was a participant in the RI/FS and did not request either fish or tissue sampling as part of the RI/FS. The individual also requested a statement that consumption of fish from downstream of the Site is not harmful. Because EPA did not sample fish at part of this RI/FS, EPA cannot provide such an assurance. It must be noted however, Federal and State agencies with the direct responsibility for issuing fishing advisories were participants in the RI/FS process and did not issue any restrictions on fish consumption from Willis Millpond during the RI/FS. The individual's third question was a request that EPA expand on its modification to SHSSW-4 that required additional monitoring at Willis Millpond. EPA's response is that EPA's Selected Remedy SHSSW-4 expands future sampling to 38 sampling locations. The exact locations of the 38 sampling locations have not yet been determined, but the locations will be between Charleston Street and Willis Millpond and will include several locations at Willis Millpond for sampling of sediment and surface water. The locations will be identified during the Remedial Design Phase.

Three individuals provided verbal comments at the public meeting. The first individual commented that EPA's consideration and incorporation of the public's input was very beneficial to the process. The individual thanked EPA for its responsiveness to public feedback.

A second individual who made public verbal comments thanked EPA and everyone who worked on the contamination problem at the AHA Site. The individual also commented that the Superfund process takes too long and that the technical jargon of the documents and presentation made it difficult for the public to understand everything. This individual also proposed that EPA should have shorter and simpler presentations. The individual also questioned how the area's property values are affected by the contamination.

EPA's response to these two individuals' comments is as follows. EPA appreciates the comments on how the Proposed Plan has incorporated public concerns expressed at other meetings. EPA recognizes the difficulty in explaining the process to citizens and the difficulty in dealing with technical terms. EPA has included either a glossary of terms or a list of abbreviations in all EPA fact sheets produced discussing the AHA Site. It should be noted that the majority of other documents produced as part of the study also have such aids for the readers. EPA also offered in several fact sheets to conduct a class to explain Superfund to the community. No one requested such a class, however, EPA has tried to make explanations as understandable as possible. In addition, EPA offered a

Technical Assistance award to the community to allow it to obtain independent technical assistance in understanding the documents produced during the RI/FS. EPA did not receive any application for the technical assistance award at this site. Finally, EPA understands the individual's comment regarding the length of EPA's presentations, however the complexity of the site and the number of remedial alternatives proposed and evaluated requires a significant amount of time to explain. As a counterpoint, an individual who submitted written comments to EPA, which are discussed later in this Responsiveness Summary asked for more detail during the EPA presentations. Obviously, different members of the public have a diversity of opinions.

A third individual presented some verbal comments at the public meeting. This individual commented on the difficulty for individuals to study the documents and comment upon them without personal copies of the documents being made available to the public. This individual also commented that the 30 day comment period was too short, and that maybe a 45 day comment period might be better. EPA's response to this individual's comments was to issue a formal extension to the comment period after advertisement. All relevant Site documents are contained in the site's Administrative Record with a copy available at the Williston Public Library and at EPA Region 4. In addition public documents are always available upon request via the Freedom of Information Act. EPA also places the Administrative Record on CD's for the public upon request and as soon as possible. The comment period's length, 30 days, is a requirement of the regulations. EPA informed the public that EPA would honor any requests to extend the comment period in 30 day increments.

One commenter, with whom another commenter concurred, provided a number of written comments to EPA on various aspects of the Proposed Plan. Several comments were in support of EPA's Proposed Plan and several comments disagreed with certain components of EPA's Proposed Plan.

These written comments addressed the three components of the remedy individually. For the equalization lagoon, the commenter concurred with EPA's selection of Alternative S-2 and agreed that mercury should be included in the list of analytes for soil sampling. The commenter specifically did not agree that mercury should be considered a COC and stated that they do not believe that the off site mercury MCL exceedances are site related. The commenter also objected to the requirement in the Proposed Plan that additional investigation be conducted to identify the precise source of the mercury. EPA's response is that mercury has been detected both on and off site. The purpose of an RI/FS is to determine the nature of contamination, the source, and the areal extent of the contamination. EPA and SCDHEC have each stated in comments on the RI/FS that the regulatory agencies disagree that the mercury is not from an on-site source. The additional work required during the RD is intended to better identify whether the source of the mercury contamination is from the Site. If a source can be identified, it may be possible to remediate that source.

For the groundwater component of the remedy (GW-4), the commenter requested that EPA better define levels that would be considered "successful" for the ERD remediation

prior to any decision to implement a contingency remedy. EPA concurs and our response is that EPA has changed the verbiage in the description of this remedy to define success as a continued trend of reduction in COC concentrations during the first five years of operation of the GW-4 ERD. EPA also notes that the Proposed Plan (and this ROD) also requires a look at other "best available technology" at that time besides pump and treat should the ERD be unsuccessful.

The commenter also questioned EPA's proposed expansion of the initial yearly sampling of 10 water supply wells to 23 wells on a quarterly basis. The commenter stated that the ten wells initially proposed to be sampled annually included wells previously found to contain mercury and/or TCE, along with three adjacent wells. EPA's response is that the ROD has reduced the requirement from 23 wells down to 20 wells (eliminating three wells to the east with no detections of COCs), but the quarterly sampling requirement, also recommended in the draft Public Health Assessment, remains. A total of twenty residential wells lie in the downgradient area from the plant where mercury and/or TCE has been detected. Strong public comments were heard at past AHA public meetings requesting a regular sampling program of all residential wells near the facility. EPA believes an expansion from 10 to all 20 wells in the affected area on a quarterly basis is warranted to answer the public's input and reassure the public in the affected area. The Proposed Plan and this ROD clearly state that the number of wells sampled can be adjusted either upward or downward dependent on the monitoring results. Additionally, the requirements for bottled water provision and monitoring will definitely change once the public water supply line is in place. The commenter also noted that there are wells in the area that are no longer in use because of property vacancies.

The commenter noted that Dixie-Narco should receive acknowledgement to have offered and provided bottled water to residents with mercury detections and to have provided a carbon filter on water supply well RW57. EPA has already responded by modifying the text of the selected alternative in this ROD to acknowledge this ongoing provision of bottled water. EPA still requires that bottled water be offered to any additional homes that will be sampled quarterly should COC contamination be detected over MCLs.

The commenter also requested removal of vinyl chloride as a COC in groundwater. EPA recognized that vinyl chloride is a degradation product of PCE and TCE, two significant site contaminants, and should therefore be monitored. However EPA has removed vinyl chloride as a COC.

The commenter's last comment on the groundwater alternative was objection to EPA's requirement for residential water bill payment for the 23 homes originally proposed in the EPA's Proposed Plan. EPA's response is to eliminate the requirement for the PRP to pay for residential water bills for homes with COC MCL exceedances. The PRP shall only be required to pay tap fees into the new water supply line for wells with MCL exceedances. This is consistent with actions taken at other Superfund sites where contamination has been found in private wells.

This commenter had several comments for the Sediments, Hydric Soils, and Surface Water selected alternative SHSSW-2. The commenter disagreed that a complete removal of impacted hydric soils and sediments is necessary arguing that "toxicity testing, risk assessment, and functional wetland analysis supports our original assertion that destruction of the Cover C wetlands is not warranted." EPA's response is predicated on the belief that wetlands can be remediated and successfully restored. Restored and constructed wetlands have proven to be excellent productive habitat. The Selected Remedy requires the complete cleanup of the wetlands, where COCs are present above clean-up levels, between the Imhoff system discharge point and Charleston Street with full wetlands and stream bank restoration.

The commenter also commented on EPA's proposal in the Proposed Plan to add a third year of toxicity testing and questioned the timing of the first toxicity testing to be concurrent with the RA. EPA's response is that the commenter has raised valid points in their comments on this issue. EPA has eliminated the requirement for the third year of toxicity testing in year three and agrees that toxicity test sampling should be conducted after the Remedial Action is complete.

Finally the commenter noted that any contingent or expanded remedy based on the findings of the toxicity testing will be discussed in the five year review and should not be addressed prior to that time. EPA agrees with this comment, but wanted to emphasize in the Proposed Plan and in this ROD that the additional sampling and toxicity testing may well expand the extent of the remediation of the sediments and hydric soils to locations further downstream.

Another commenter provided written comments to EPA during the comment period. This individual's comments addressed both the Superfund process and the Proposed Plan. The individual expressed concern that there were too few public meetings, that the public did not have enough involvement in the process, and that the information presented was difficult to understand or lacked sufficient detail. EPA's response is that four public meetings were held by EPA throughout the RI/FS process, plus an availability session, and an informal meeting with property owners. Six fact sheets were produced during the RI/FS. Both the number of meetings and fact sheets exceed what is mandated in the regulations. EPA has addressed the difficulty in explaining technical documents to communities by providing glossaries and/or lists of abbreviations in all fact sheets and site documents, offering a technical assistance awards, and offering classes in Superfund basics. EPA scheduled and provided an availability session for the AHA RI/FS to better answer questions and explain items to community members in lay person terms. EPA also offered to meet with a local environmental organization and add their members to EPA's mailing list. Both offers were declined.

This commenter also stated that EPA's presentation did not adequately show the destruction of the discharge wetlands. EPA states that the RI/FS provides detailed documentation on the condition of the Imhoff wetlands. The EPA-prepared slide show that preceded the Public Meeting did show several pictures illustrating the condition of the wetlands.

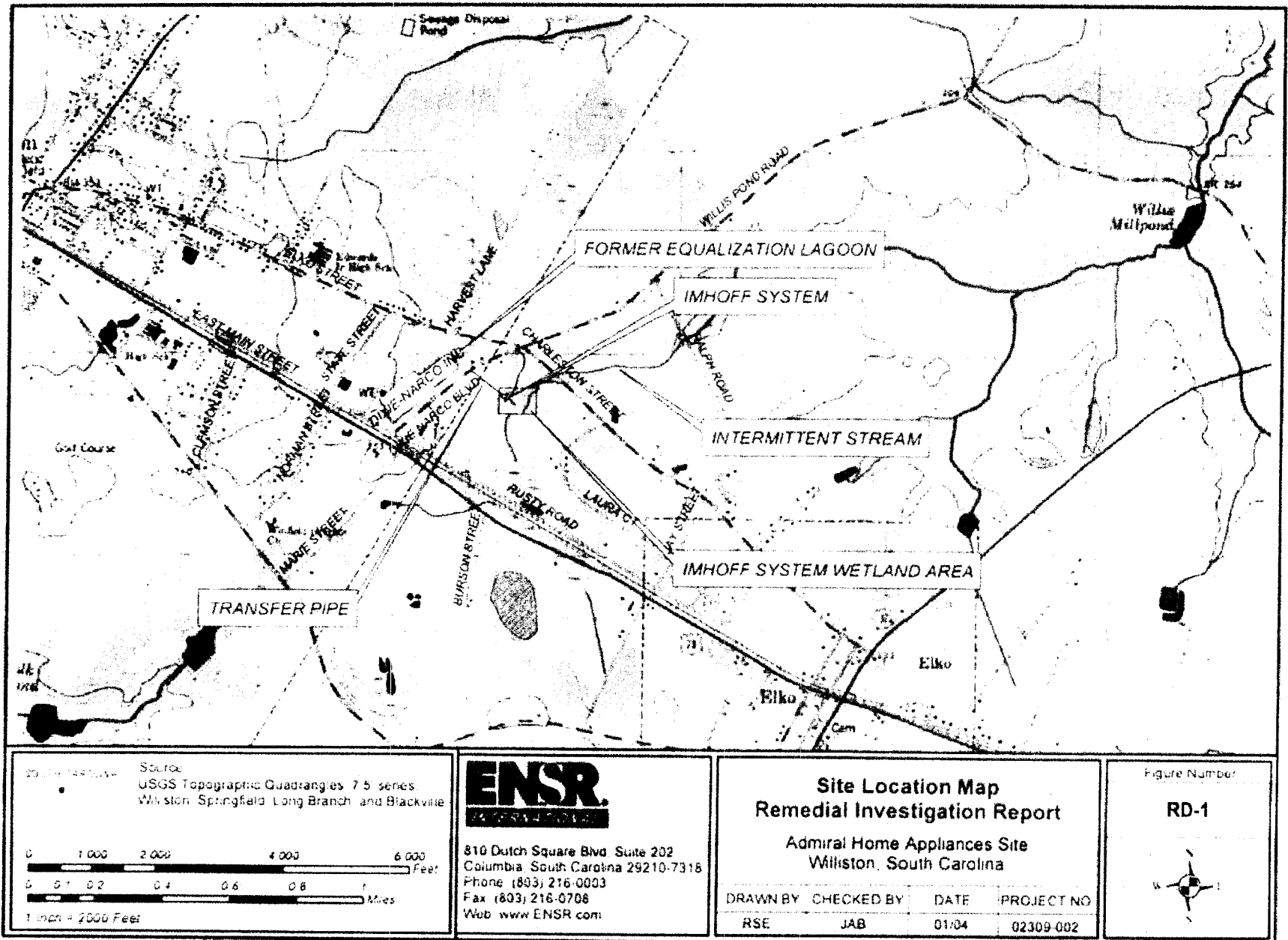
The individual stated that the public should be involved in the selection of the initial alternatives and that there was not enough information in the proposed plan fact sheet to evaluate the alternatives. EPA has made every effort to involve the public in the RI/FS process through multiple public meetings held over the course of the RI/FS and through the publication of the fact sheets discussing both the process and the progress and findings of the RI/FS. In terms of the amount of information contained in the fact sheets, EPA responds by stating that all supporting documents have been made available to the public when they were finalized at the Williston Public Library. The Administrative Record is now available there. The commenter also argued that remedy cost figures should not be included in the documents. EPA responds by stating that an analysis of the cost of each alternative is required by the National Contingency Plan, and cost is one of the nine evaluation criteria.

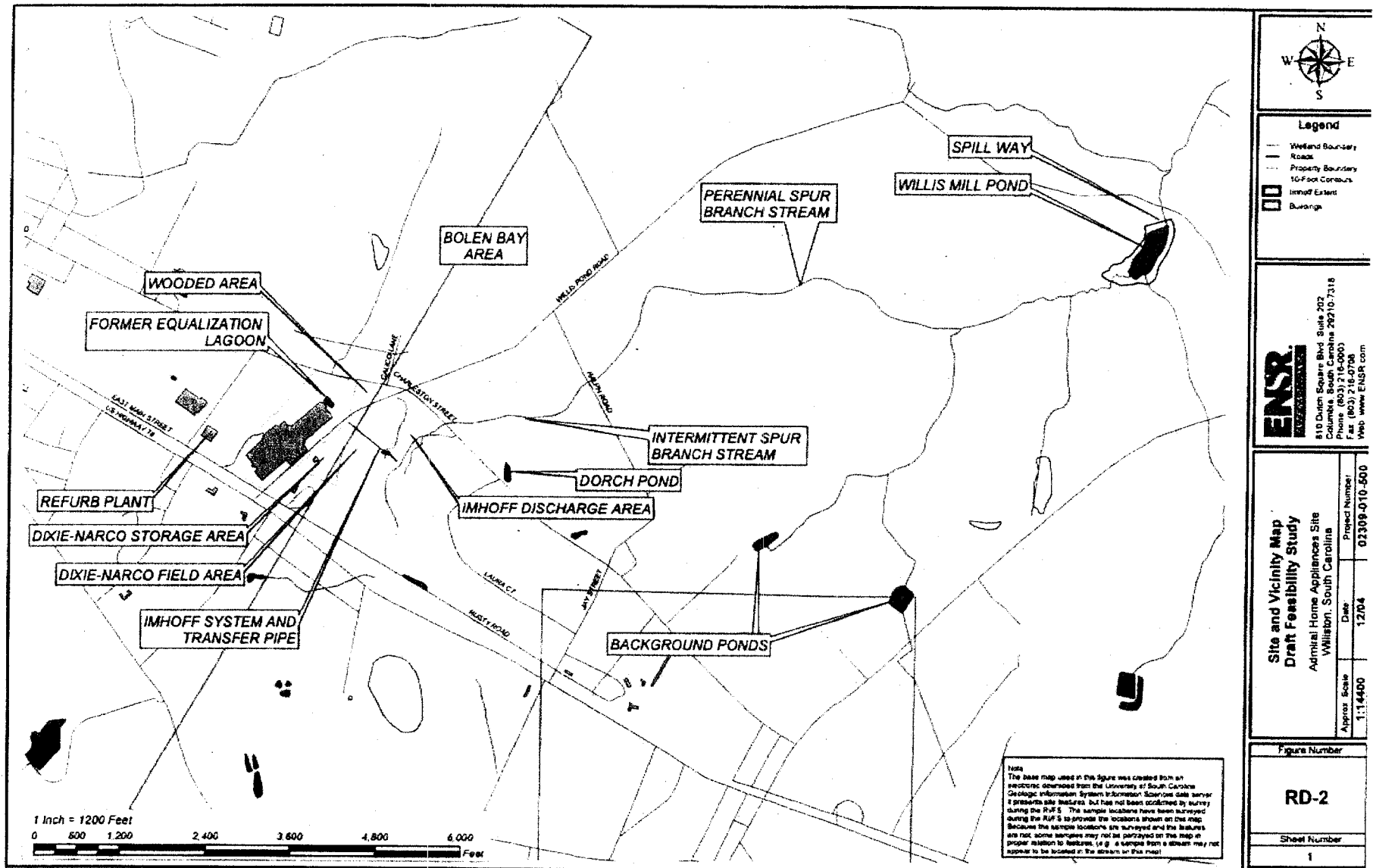
The individual asked if the Edisto River was addressed in the RI/FS and if the Willis Millpond area had been sampled. EPA's response is that the RI/FS did include limited sampling beyond Willis Millpond, but within several hundred feet downstream. The Edisto River is over eight stream miles further downstream and sampling that distance downstream was not warranted. Numerous locations in and around Willis Millpond were sampled during the RI/FS and the RI/FS documents contain this information.

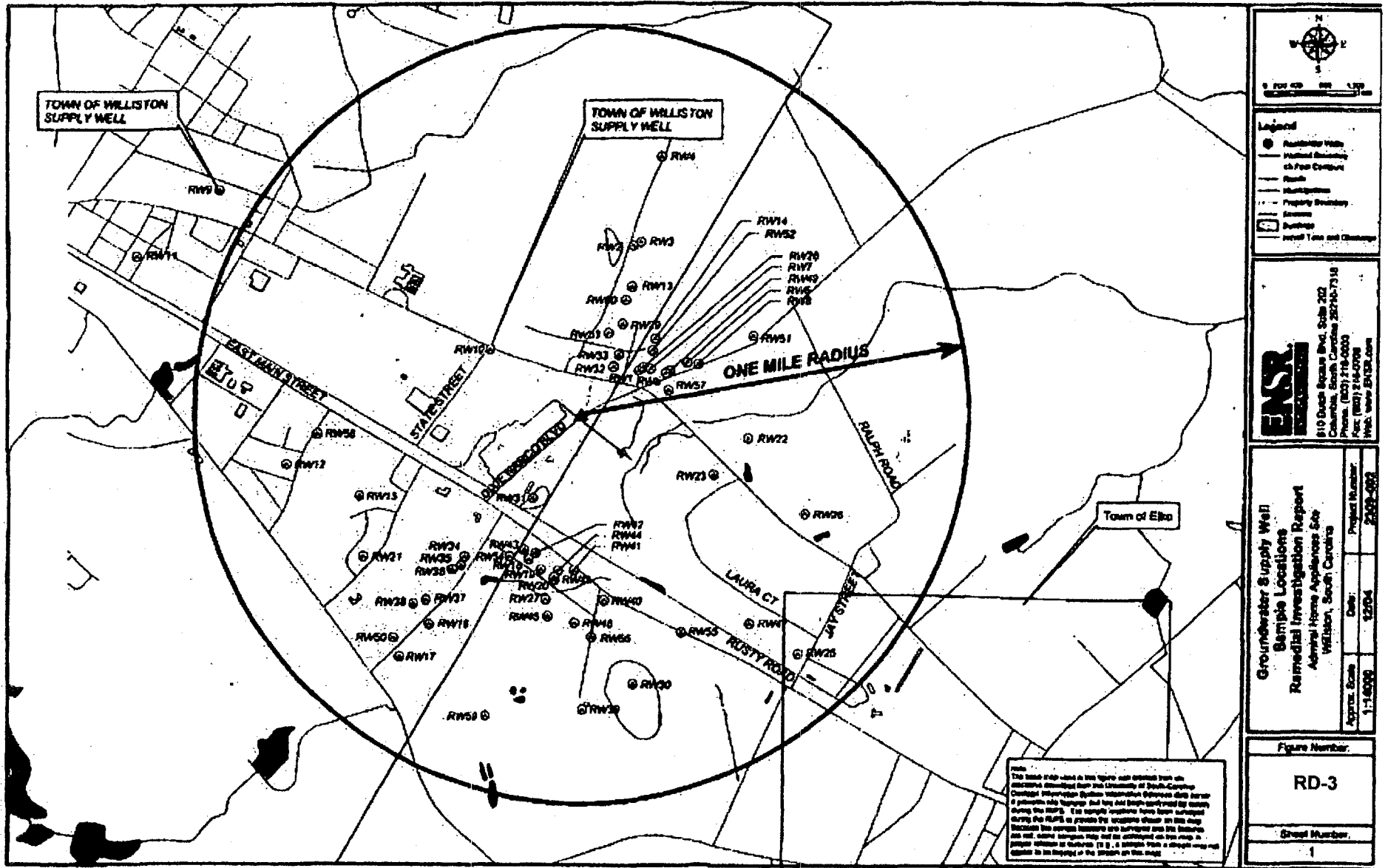
The commenter asked about a health study of people living in the impacted area. The Public Health Assessment conducted by SCDHEC for ATSDR was described at the 8/25/05 meeting. A draft copy of the Public Health Assessment for public comment was promised by a SCDHEC representative in the near future.

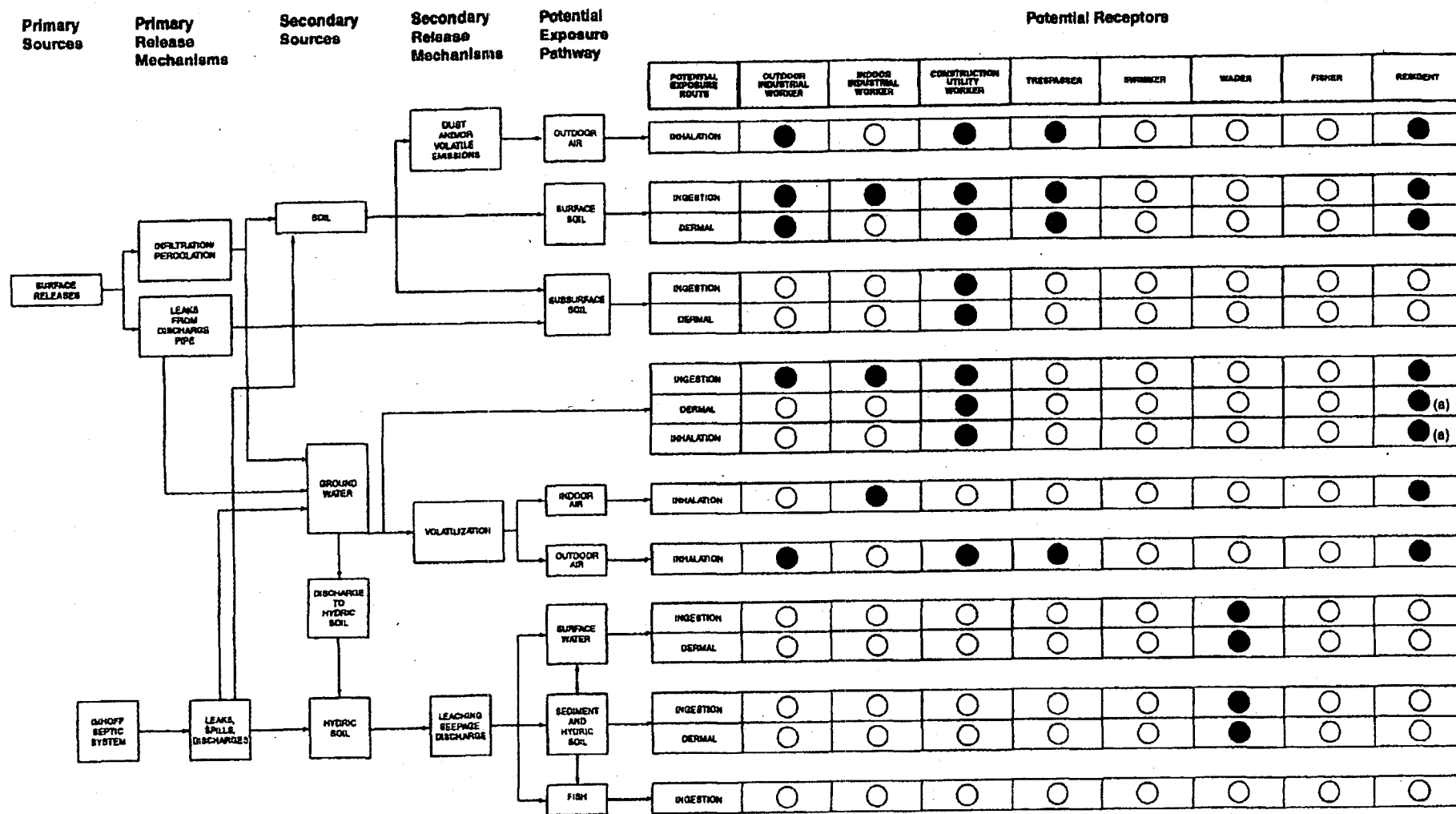
At the August 25, 2005 Proposed Plan Public Meeting an audience member commented that 30 days was insufficient time to review the Proposed Plans and the related documents that the Proposed Plan was based upon. EPA proceeded to advertise in a local newspaper that the comment period for the Admiral Proposed Plan would be extended an additional 30 days from the date of advertisement. The ad ran in October, 2005 advertising an extension for the comment period from October 7, 2005 to November 7, 2005. In addition, EPA Office of Public Affairs issued a press release to all area media regarding the comment period extension.

During the extension to the comment period, two area residents sent a joint written comment to EPA requesting the testing of fish from Willis Millpond. One of these individuals had provided the same written comment at the public meeting on August 25, 2005. EPA's response to the same comment at the August public meeting was provided earlier in this Responsiveness Summary. EPA wishes to note again the facts that the type of contamination discovered in Willis Millpond does not bioaccumulate in fish and that the contaminants detected in Willis Millpond are insoluble and are unlikely to be transferred to fish. The only comment received during the extension was this written letter and a copy has been placed in the Administrative Record.







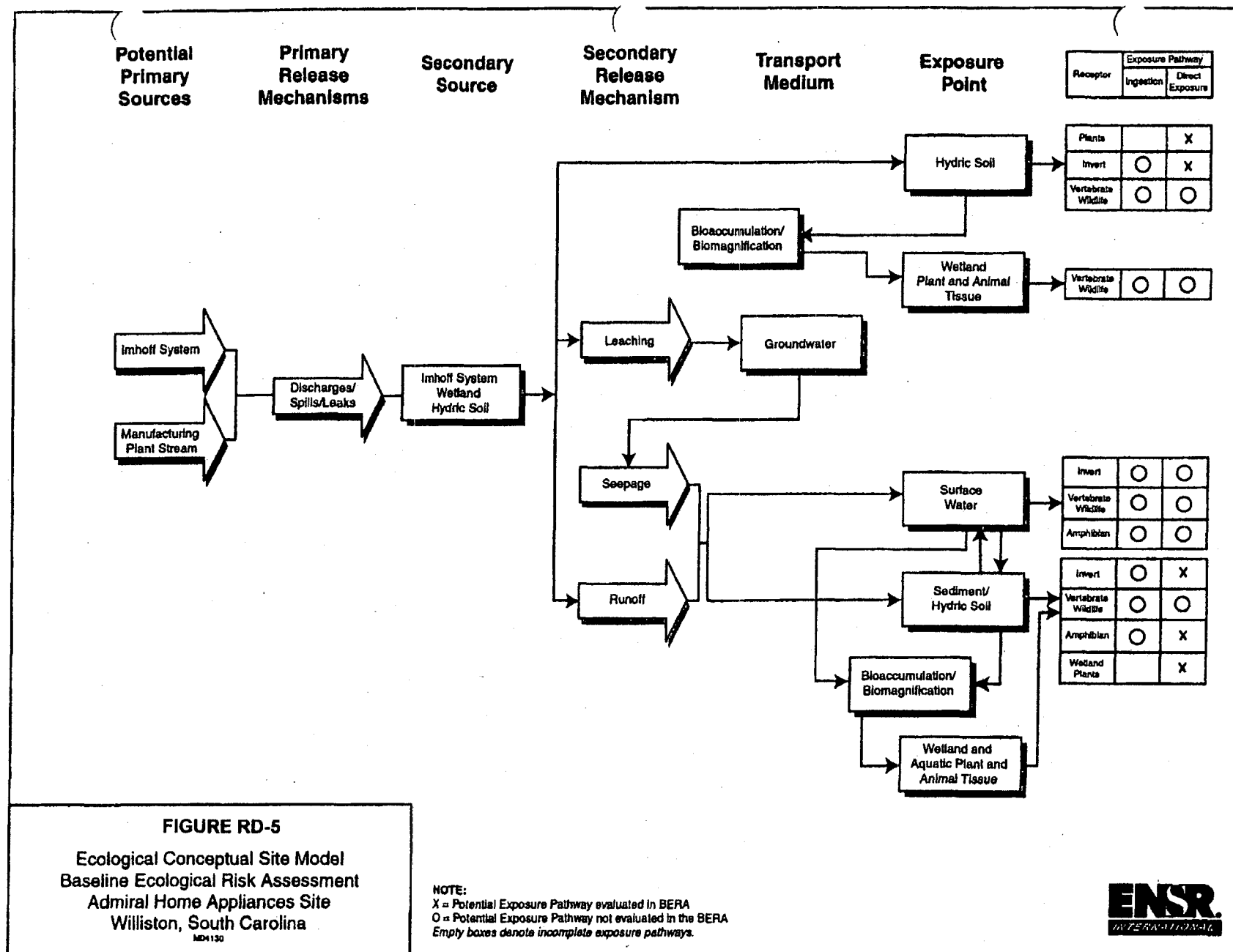


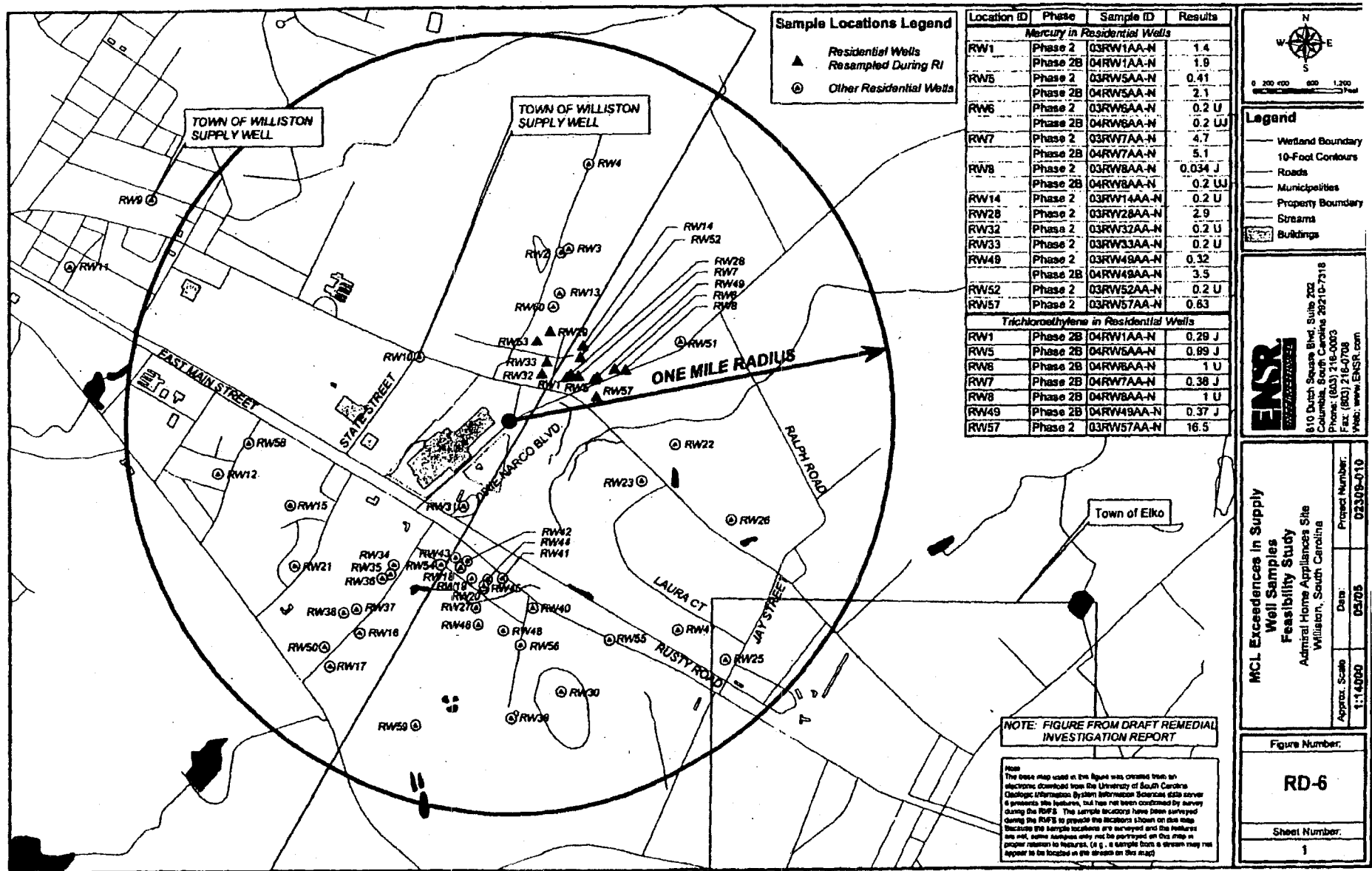
Key:

- Pathway potentially complete, evaluation further in HHRA.
- Pathway evaluated and found incomplete or insignificant, no further evaluation recommended.
- (a) Qualitative evaluation

FIGURE RD-4

Conceptual Site Exposure Model
Human Health Risk Assessment
Admiral Home Appliances





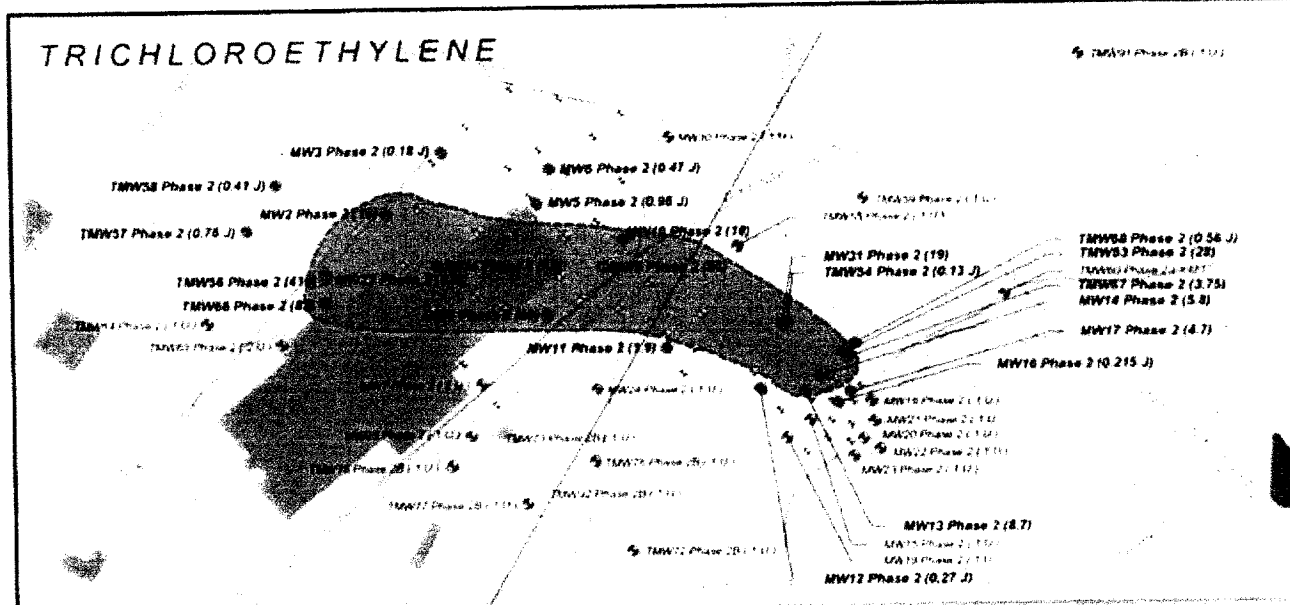


FIGURE RD-7 TCE in shallow groundwater

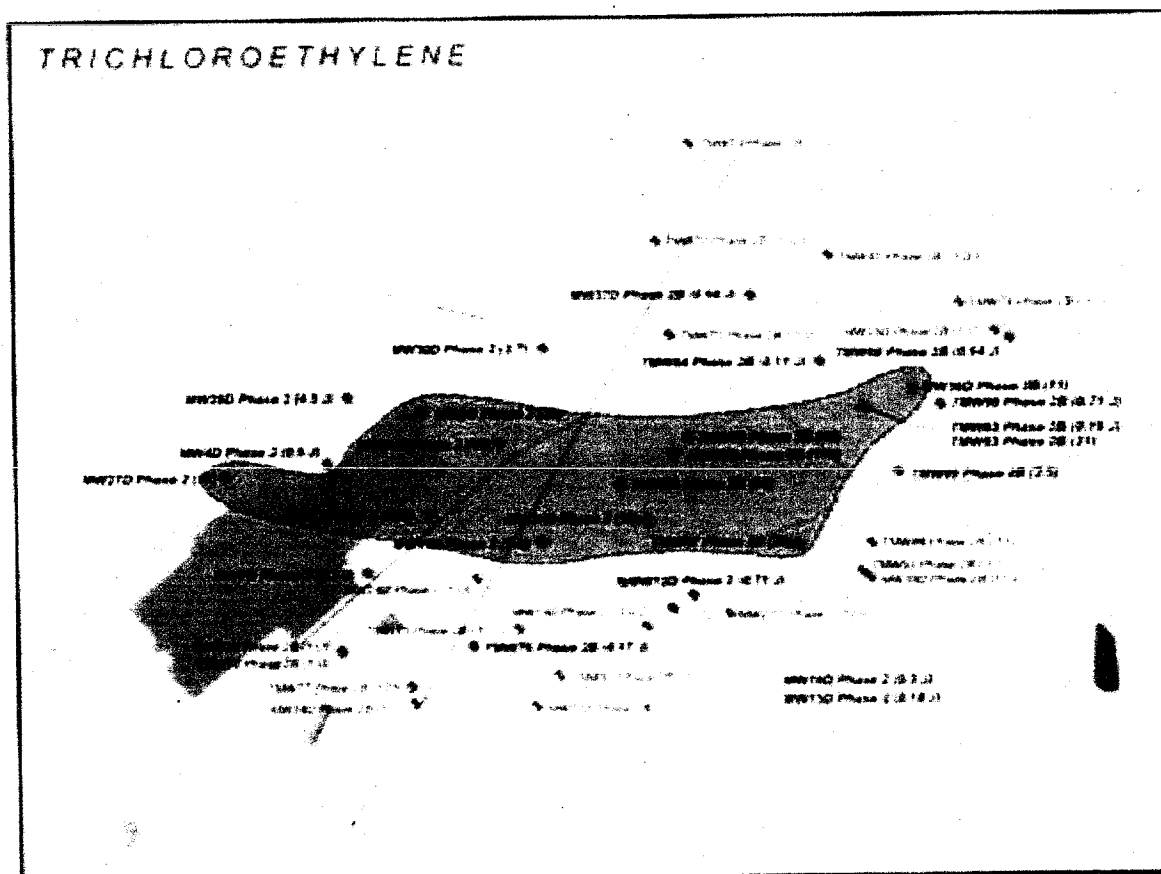


FIGURE RD-8 TCE in deep groundwater

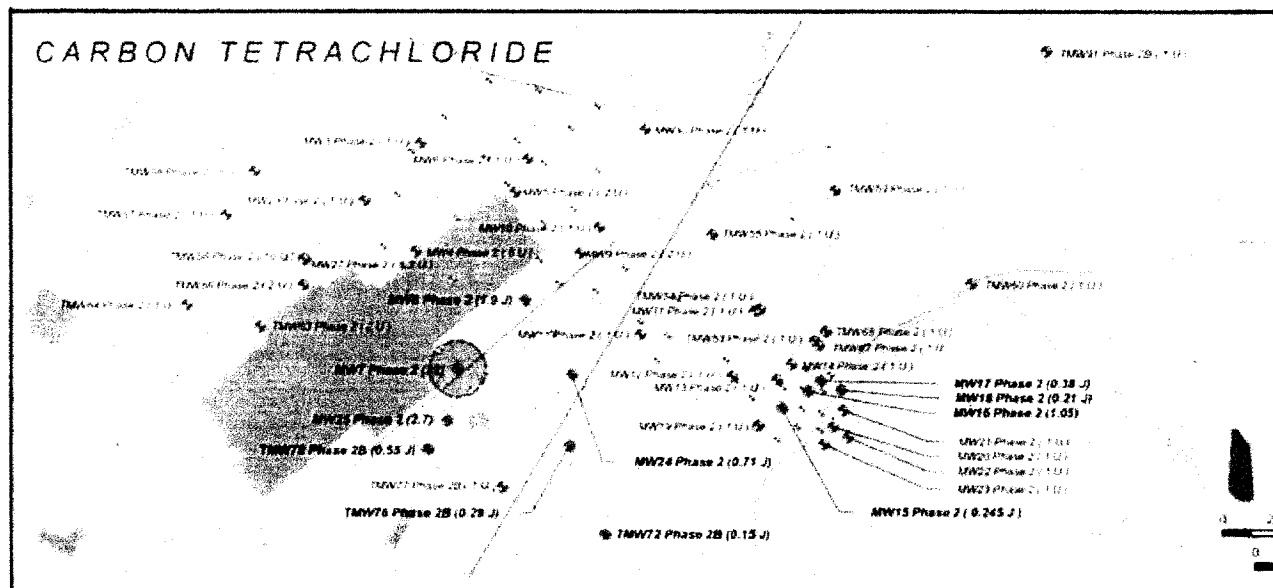


FIGURE RD-9 Carbon Tetrachloride in shallow groundwater.

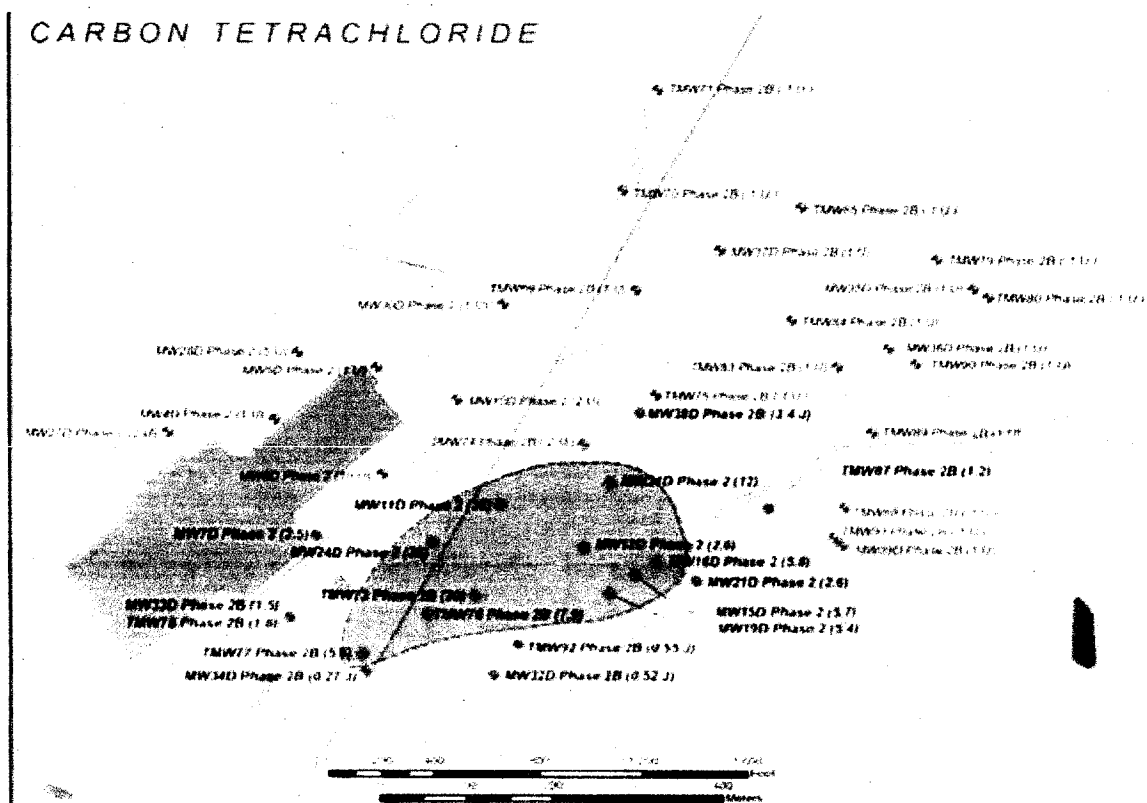


FIGURE RD-10 Carbon Tetrachloride in deep groundwater.

Table RD-1
Remedial Investigation
Monitoring Well Summary
Admiral Home Appliances Site
Williston, S.C.

Well Identification	Phase	Total Depth of Boring	Screened Interval	Top of Casing Elevation (ft-msl)	Location
MW's					
MW1	Phase 1B	66.5	66.3 - 56.3	354.93	West side of Plant near water tower
MW1D	Phase 1B	86.32	86.1 - 81.1	355.04	West side of Plant near water tower
MW2	Phase 1B	34.67	34.47 - 24.47	340.07	Northwest of Plant in parking lot along fence
MW3	Phase 1B	37.67	37.67 - 27.67	338.27	Northwest of Plant in parking lot along fence
MW4	Phase 1B	22.89	22.69 - 12.69	331.64	West side of Plant near loading docks
MW4D	Phase 1B	50.62	50.42 - 45.42	331.28	West side of Plant near loading docks
MW5	Phase 1B	36.49	36.29 - 26.29	334.56	Northeast end of Plant
MW5D	Phase 1B	55.44	55.24 - 45.24	334.59	Northeast end of Plant
MW5D2	Phase 1B	90	80 - 90	334.52	Northeast end of Plant
MW5D3	Phase 1B	128	118 - 128	334.46	Northeast end of Plant
MW6	Phase 1B	37.82	37.62 - 27.62	333.67	Northeast end of Plant in parking lot
MW7	Phase 1B	35.36	35.16 - 25.16	341.64	East side of Plant inside fence
MW7D	Phase 1B	63	58 - 63	342.41	East side of Plant inside fence
MW8	Phase 1B	35.73	35.53 - 25.53	332.23	East side of Plant inside fence near water tank
MW8D	Phase 1B	52.87	52.67 - 47.67	332.41	East side of Plant inside fence near water tank
MW8D2	Phase 1B	95	90 - 95	332.96	East side of Plant inside fence near water tank
MW8D3	Phase 1B	128	116 - 126	332.68	East side of Plant inside fence near water tank
MW9	Phase 1B	30.02	29.82 - 19.82	331.59	Northeast end of Plant in parking lot near gate
MW10	Phase 1B	33.18	32.98 - 22.98	330.23	Northeast end of Plant in parking lot near gate
MW10D	Phase 1B	58	53 - 58	329.75	Northeast end of Plant in parking lot near gate
MW11	Phase 1B	37.55	34.8 - 24.8	331.13	Dixie-Narco field southeast of gate
MW11D	Phase 1B	58	54.8 - 49.8	331.28	Dixie-Narco field southeast of gate
MW11D2	Phase 1B	88	77.8 - 87.8	331.88	Dixie-Narco field southeast of gate
MW12	Phase 1B	21.67	20 - 10	321.79	Dixie-Narco field northwest of Imhoff near influent piping
MW12D	Phase 1B	50.25	47.8 - 42.8	321.43	Dixie-Narco field northwest of Imhoff near influent piping
MW13	Phase 1B	22.59	19.8 - 9.8	315.48	Woods northwest of discharge area
MW14	Phase 1B	22.84	19.8 - 9.8	316.49	Woods northwest of discharge area
MW15	Phase 1B	18.45	14.8 - 4.8	314.34	Discharge area
MW15D	Phase 1B	45.77	42.47 - 37.47	313.53	Discharge area
MW16	Phase 1B	20.13	16.8 - 6.8	313.1	Discharge area
MW16D	Phase 1B	47.43	44.43 - 39.43	313.45	Discharge area
MW17	Phase 1B	19.37	16.5 - 6.5	313.01	Discharge area
MW18	Phase 1B	22	19.6 - 9.6	312.59	Discharge area
MW19	Phase 1B	20.18	17.38 - 7.38	314.68	Woods south of Imhoff
MW19D	Phase 1B	48.11	44.8 - 39.8	315.16	Woods south of Imhoff
MW20	Phase 1B	22.67	18.8 - 8.8	312.71	Woods south of Imhoff

Table RD-1
Remedial Investigation
Monitoring Well Summary
Admiral Home Appliances Site
Williston, S.C.

MW21	Phase 1B	22.92	19.6 - 9.6	312.54	Woods east of intermittent stream
MW21D	Phase 1B	48.18	44.8 - 39.8	313.08	Woods east of intermittent stream
MW22	Phase 2	20	9.3 - 19.3	317	Woods east of intermittent stream edge of Sapp field
MW23	Phase 2	16	6.0 - 16.0	313.56	Woods east of intermittent stream near Sapp field
MW24	Phase 2	30	20 - 30	338.12	East of Dixie-Narco Blvd. Near burner
MW24D	Phase 2	58	53 - 58	337.61	East of Dixie-Narco Blvd. Near burner
MW25	Phase 2	38	24.7 - 34.7	344.54	East of Dixie-Narco Blvd. Northeast of parking lot
MW26	Phase 2	48	38 - 48	353.59	West of Plant in trailer parking area
MW27	Phase 2	44	34 - 44	350.12	West of Plant in gravel along side of entry road
MW27D	Phase 2	64	54 - 64	350.16	West of Plant in gravel along side of entry road
MW27D2	Phase 2	108	94 - 104	350.26	West of Plant in gravel along side of entry road
MW28D	Phase 2	78	73 - 78	332.89	Northwest of Plant in parking lot
MW29D2	Phase 2	88	83 - 88	319.95	Intersection of Dixie-Narco Blvd. And Elko St.
MW29D3	Phase 2	116	106 - 116	319.94	Intersection of Dixie-Narco Blvd. And Elko St.
MW30	Phase 2	30	20 - 30	325.66	Northeast of Plant outside fence in woods
MW30D	Phase 2	58	52.7 - 57.7	325.6	Northeast of Plant outside fence in woods
MW30D2	Phase 2	88	82.7 - 87.7	325.41	Northeast of Plant outside fence in woods
MW30D3	Phase 2	148	110.7 - 120.7	325.02	Northeast of Plant outside fence in woods
MW31	Phase 2	28	17.8 - 27.8	323.64	Dixie-Narco field east of gate
MW31D	Phase 2	58	53 - 58	323.68	Dixie-Narco field east of gate
MW32D	Phase 2B	62.68	55.07 - 60.07	326	South end of Dixie-Narco field
MW33D	Phase 2B	64.27	59.27 - 64.27	347.94	East of Dixie-Narco Blvd. Southeast of parking lot (inside fence)
MW34D	Phase 2B	63.41	58.41 - 63.41	343.71	East of Dixie-Narco Blvd. South of parking lot (outside fence)
MW35D	Phase 2B	62.85	55.29 - 60.29	321.6	East end of QSN field
MW36D	Phase 2B	62.82	55.5 - 60.5	318.1	West end of QSN field
MW37D	Phase 2B	65.15	60.32 - 65.32	329.05	Northwest of Dixie-Narco Blvd. And Elko St. intersection
MW38D	Phase 2B	63.14	55.05 - 60.05	324.89	Woods Northeast of Dixie-Narco field East of Dixie-Narco Blvd.
MW39D	Phase 2B	60.26	55.36 - 60.36	313.71	Northwest end of Sapp field

WHAT IS RISK AND HOW IS IT CALCULATED?

A Superfund human health risk assessment estimates the "baseline risk." This is an estimate that the likelihood of health problems could potentially occur if no cleanup action were taken at a site. To estimate the baseline risk at a Superfund site, EPA undertakes a four-step process:

- Step 1: Analyze Contamination
- Step 2: Estimate Exposure
- Step 3: Characterize Site Risk
- Step 4: Summarize Site Risk

In Step 1, EPA looks at the concentrations of contaminants found at a site as well as past scientific studies on the effects these contaminants have had on people (or animals, when human studies are unavailable). Comparisons between site-specific concentrations and concentrations determined to be safe based on toxicity studies helps EPA to determine which contaminants are most likely to pose the greatest threat to human health.

In Step 2, EPA considers the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, EPA calculates a "**reasonable maximum exposure**" (RME) scenario, which portrays the highest level of human exposure that could reasonably be expected to occur.

In Step 3, EPA uses the information from Step 2 combined with information on the toxicity of each chemical to assess potential health risks. EPA considers two types of risk: cancer risk and non-cancer risk. The likelihood of any kind of cancer resulting from a Superfund site is generally expressed as a lower and an upper bound probability; for example, a "1 in 1,000,000 to 1 in 10,000 chance." In other words, for every 10,000 people that could be exposed, one extra cancer *may* occur as a result of exposure to site contaminants. An extra cancer case means that one more person could get cancer than would normally be expected to from all other causes. For non-cancer health effects, EPA calculates a "hazard index." The key concept here is that a "threshold level" (measured usually as a hazard index of less than 1) exists below which non-cancer health effects are not expected to occur.

In Step 4, EPA determines whether site risks are great enough to cause concern based on potential health problems for people at or near the superfund site. The results of the three previous steps are combined, evaluated and summarized. EPA adds up the potential risks from the individual contaminants and exposure pathways and calculates a total site risk.

Table RD-2
Identification of Chemical-Specific ARARs
Admiral Home Appliances Site
Williston, South Carolina

Requirement	Citation	Description	Comments
Safe Drinking Water Act: National Primary Drinking Water Standards	40 CFR 141	Establishes health-based standards for public water systems (maximum contaminant level goals (MCLGs) and maximum contaminant levels (MCLs).	Applicable to potential drinking water sources.
Safe Drinking Water Act: National Secondary Drinking Water Standards	40 CFR 143	Establishes standards for the aesthetic qualities (e.g., taste, odor, color, appearance) of public water systems (secondary MCLs).	Secondary MCLs are not federally enforceable but are intended as guidelines for the states (To Be Considered [TBC]).
State Safe Drinking Water Act: Primary Drinking Water Regulations	SCR.61-58	Establishes MCLs and Secondary MCLs for contaminants in public water systems	DHEC has adopted USEPA MCLs as state drinking water standards. Applicable to potential drinking water sources.
Clean Water Act: USEPA Ambient Water Quality Criteria (AWQC)	40 CFR 131	Objectives are to restore and maintain the chemical, physical, and biological integrity of the nation's waters.	May be relevant and appropriate when modified to reflect the designated or potential use of the affected waters, the media affected, and the purpose of the criteria.

Table RD-2
Identification of Chemical-Specific ARARs
Admiral Home Appliances Site
Williston, South Carolina

Requirement	Citation	Description	Comments
South Carolina Pollution Control Act: Water Classifications and Standards	SCR.61-68	Objectives are to restore and maintain the chemical, physical, and biological integrity of the state's surface waters. Allows mixing zone waiver when certain criteria are met.	Incorporates by reference the USEPA criteria for surface water. May apply to alternate remedial goals for constituents in groundwater that discharge to a surface water stream.
USEPA Health Advisories	Various	Establishes guidelines for constituents that may be intermittently encountered in the public water systems.	These are non-enforceable guidelines (TBCs) that may be pertinent for constituents present at the site not regulated by SDWA.
Resource Conservation and Recovery Act (RCRA)	40 CFR 268	Establishes treatment standards based on best demonstrated available technology for treatment of hazardous wastes.	May be applicable to off-site treatment of impacted soils. Hazardous wastes are not anticipated at this site.
Clean Air Act: National Primary and Secondary Ambient Air Quality Standards (NAAQS)	40 CFR 50	Establishes standards for ambient air quality to protect public health and welfare.	May be applicable during a remedial action (e.g., soil excavation and particulate entrainment in wind, air stripping, thermal destruction).

Table RD-2
Identification of Chemical-Specific ARARs
Admiral Home Appliances Site
Williston, South Carolina

Requirement	Citation	Description	Comments
Clean Air Act: National Emissions Standards for Hazardous Air Pollutants (NESHAPs)	40 CFR 61	Sets emission standards for pollutants for which no Ambient Air Quality Standards exist.	May be applicable during a remedial action (e.g., soil excavation and particulate entrainment in wind, air stripping, thermal destruction).
South Carolina Pollution Control Act: Air Pollution Control Regulations and Standards	SCR.61-62	Specifies emissions limits and conditions under which emissions may occur.	May be applicable during a remedial action (e.g., soil excavation and particulate entrainment in wind, air stripping, thermal destruction).
OSHA: Permissible Exposure Limits		Establishes 8-hour time-weighted average or ceiling concentrations above which workers may not be exposed.	Applicable to implementation of remedial actions.

Table RD-3
Identification of Potential Action-Specific ARARs

Admiral Home Appliances Site
Williston, South Carolina

Requirement	Citation	Description	Comments
Construction Standards	29 CFR 1929	Establishes occupational safety and health standards for the construction industry	Potentially applicable if remedial actions involve construction and excavation to certain depths.
Occupational Safety and Health Administration Regulations	29 CFR Parts 1904, 1910, and 1926	Occupational safety and health requirements applicable to workers engaged in onsite work during implementation of remedial actions	Applicable to response actions involving excavation (soil), collection (groundwater), treatment (all media), and disposal (onsite).
South Carolina Storm Water Management and Sediment Reduction Act	Title 48, Chapter 14, Article 50	Requires a storm water management and sediment control plan be submitted prior to engaging in a land disturbing activity. A permit to proceed must be obtained.	Potentially applicable for actions involving excavation.
DOT Rules for Hazardous Materials Transport	49 CFR Parts 107, 171-179	Regulates the transport of hazardous materials	Applicable if offsite shipment of hazardous wastes/materials/soils occurs. Hazardous waste/material is not anticipated at the site.

Table RD-3
Identification of Potential Action-Specific ARARs

Admiral Home Appliances Site
Williston, South Carolina

Requirement	Citation	Description	Comments
Identification and listing of hazardous waste	40 CFR 261 et. seq.)	Defines those solid wastes that are subject to regulation as hazardous wastes under 40 CFR 262-265, and 271	Are applicable if hazardous wastes are generated on site as a result of cleanup activities. Hazardous wastes are not anticipated at this site.
Land Disposal	40 CFR 268	Prohibits land disposal of specified untreated hazardous wastes and provides special requirements for handling such wastes.	Land disposal treatment requirements are potentially applicable for disposal of hazardous waste/soils (e.g., disposal of contaminated hazardous soils at an offsite disposal facility). Hazardous wastes are not anticipated at this site.
Standards applicable to owners/operators of hazardous waste treatment, storage, and disposal facilities	40 CFR 265	Establishes minimum national standards that define the acceptable management of hazardous waste for owners and operators of facilities that treat, store, or dispose of hazardous waste.	May be relevant & appropriate if remedial actions involve on-site ex-situ methods which meet the definitions of treatment, storage, or disposal of hazardous waste. Does not apply to in-situ treatment of soils and groundwater. Hazardous wastes are not anticipated at this site.

Table RD-3
Identification of Potential Action-Specific ARARs

Admiral Home Appliances Site
Williston, South Carolina

Requirement	Citation	Description	Comments
Manifest System Recordkeeping and Reporting	40 CFR 262 Subpart B	Establishes tracking procedures for hazardous materials that are transported off-site.	Applicable if hazardous materials must be transported offsite. Hazardous wastes are not anticipated at this site.
Underground Injection Control Regulations (UIC)	40 CFR 122, 125	Regulates underground injection of waste and other industrial fluids	Applicable to injection wells used for remedial actions such as air sparging, bioremediation, etc.
Clean Water Act	40 CFR 122, Section 410 and 404	Regulates discharges of dredged or fill materials into waters of the United States.	Potentially applicable if treatment causes a sediment discharge into a surface water.
Clean Water Act: National Pollution Discharge Elimination System (NPDES)	40 CFR 122, 125	Requires permits for the discharge of any pollutants from any point source into waters of the U.S. Permits based on ambient water quality criteria.	Applicable for remedial actions involving discharge treated water into surface waters.
Clean Water Act: National Pretreatment Standards	40 CFR 403	Sets standards to control pollutants which pass through or interfere with treatment processes in POTWs or which may contaminate sewage sludge.	Applicable if remedy discharges waste to local POTW.

Table RD-3
Identification of Potential Action-Specific ARARs

Admiral Home Appliances Site
Williston, South Carolina

Requirement	Citation	Description	Comments
South Carolina Groundwater Mixing Zone Requirements	SC R.61-68	Establishes guidelines for groundwater mixing zones.	Potentially applicable.
DHEC Enabling Act: Underground Injection Control	SCR.61-87	Provides for protection of underground sources of drinking water	Applicable to injection wells used for remedial actions such as air sparging, bioremediation, etc.
South Carolina Pollution Control Act: Water Pollution Control Permits	SCR.61-9	Establishes the NPDES permit program.	Potentially applicable for options involving treat and disposal of water into a surface water.
South Carolina Pollution Control Act: Air Pollution Control Regulations and Standards	SC R.61-62	A construction permit must be obtained from DHEC prior to constructing, altering or adding to a source of air contaminants, including installation of a device for the control of air contaminant discharges.	Potentially applicable for actions such as air stripping, soil vapor extraction, etc.

Table RD-4
Identification of Potential Location-Specific ARARs

Admiral Home Appliances Site
Williston, South Carolina

Requirement	Citation	Description	Comments
RCRA	40 CFR 264.18b	Regulates hazardous waste treatment, storage, or disposal facilities within the 100-year floodplain. Must be designated, constructed, operated, and maintained to prevent washout.	Potentially applicable if the site is located in a floodplain and hazardous waste are managed.
Floodplain Management Policy	Executive Order 11988, 40 CFR 6.302, Appendix A	Must take action to avoid or minimize potential harm to floodplains, and restore and preserve natural and beneficial values.	Applicable because some of the impacted soils and sediments are within a floodplain.
South Carolina Hazardous Waste Management Act	Title 44, Chapter 56, Article 1	Establishes standards for the location of hazardous waste treatment, storage, and disposal facilities to more effectively ensure long-term protection of human health and the environment.	Hazardous wastes are not anticipated at this site.
National Archeological and Historical Preservation Act	(16 USC Section 469) and 38 CFR 65	Must take action to recover and preserve artifacts	Potentially applicable if the site contains scientific, prehistoric, historic or archaeological artifacts onsite (none anticipated).

Table RD-4
Identification of Potential Location-Specific ARARs

Admiral Home Appliances Site
Williston, South Carolina

Requirement	Citation	Description	Comments
Endangered Species	Endangered Species Act, 50 CFR Part 200, 402	Requires action to conserve endangered species and/or critical habitats upon which endangered species depend.	No known endangered species are present at the site.
Wetlands Protection Policy	Executive Order 11990, 40 CFR 6.302(a) and Appendix A	Requires consideration of adverse impacts associated with destruction or loss of wetlands and to avoid support of new construction in wetlands if practical alternative exists	Potentially applicable if removal of wetland soils and sediments adversely impacts the wetland area.
Fish and Wildlife Coordination Act	(16 USC 661 et. Seq.)	Must take action to protect fish or wildlife	Potentially applicable if remedial actions include structural modifications or control of streams, rivers, or water bodies are not anticipated (None anticipated).

Summary of Evaluation Criteria	
<p>How Evaluation Criteria are Used</p> <p>In selecting a preferred cleanup alternative, the EPA uses the criteria presented here.</p> <p>The first two must be met before an alternative is considered further.</p> <p>The next five are used to further evaluate options.</p> <p>The final two are then used to evaluate the remaining options after comments have been received from the community and the state.</p>	<p>Overall Protectiveness of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.</p>
	<p>Compliance with ARARs evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.</p>
	<p>Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.</p>
	<p>Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.</p>
	<p>Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.</p>
	<p>Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.</p>
	<p>Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.</p>
	<p>State/Support Agency Acceptance considers whether the State agrees with EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.</p>
	<p>Community Acceptance considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.</p>

Table 5-1
Opinion of Probable Costs for No Action of Equalization Lagoon Sludge (Alternative S1)
Record of Decision
Admiral Home Appliances Site
Williston, South Carolina

DESCRIPTION	NOTES	UNIT	QTY	UNIT COST (\$)	TOTAL COST (\$)
I. Mandated Five-Year Review					
1. 5-Year CERCLA Review - Sludge/waste and Soil Sampling	a/	ls	1	\$13,200	\$13,200
2. 5-Year CERCLA Review Sampling Report		ls	1	\$5,000	\$5,000
3. Regulatory Meeting/Negotiation		ls	1	\$5,000	\$5,000
4. Project Management/Coordination	b/	ls	1	\$2,600	\$2,600
Subtotal Five-Year Review Costs					\$25,800
5. Contingency (20% of Five-Year Review Costs)					\$5,160
Total Five-Year Review Costs					\$30,960
Present Worth of Total Five-Year Review Costs over for 30 Years (6 events)	c/				\$66,800
PRESENT WORTH OF TOTAL PROBABLE COSTS					\$66,800

Notes and Major Assumptions:

- a/ Assumes analysis of 15 soil samples plus 5 QA/QC. - SVOCs (8270) & 4 Metals (chromium, iron, nickel and zinc).
- b/ Project management and coordinating all project related activities.
- c/ Present worth of 5 yr. review costs based on rate of 7%, assuming year-end distribution .
- Estimates are based on information currently available and on assumptions listed in this report.
- Costs are based on vendor information, contractors' estimate, cost estimation manuals, and past experience.
- Abbreviations: ls = lump sum

Table 5-2
Opinion of Probable Costs for Excavation and Off-Site Disposal of Equalization Lagoon Sludge (Alternative S2)
Record of Decision
Admiral Home Appliances Site
Williston, South Carolina

Description	Notes	Unit	Est. Quantity	Unit Cost (\$)	Total Cost
I. Design Services					
1. Project Management/Coordination	a/	ls	1	\$6,400	\$6,400
2. Remedial Design Reports (30%, 60% & 100%)	b/	ls	1	\$50,000	\$50,000
3. Contract Documents/Construction Plans/Specifications/HASP		ls	1	\$5,000	\$5,000
4. Prebid meeting/contractor selection/contracting/planning		ls	1	\$2,500	\$2,500
Subtotal Design Services Costs					\$63,900
5. Contingency (20% of Design Services Costs)					\$12,780
Total Design Services Costs					\$76,680
Present Worth Design Services Costs (Year 1) (assumed to be disbursed in Year 1)	c/				\$71,700
II. Construction Costs					
1. Excavation and Off-Site Disposal					
a. Mobilization/Demobilization		ls	1	\$2,500	\$2,500
b. Concrete/Asphalt Removal/Decon/Staging Areas Setup	d/	ls	1	\$5,000	\$5,000
c. Excavation of sludge/waste and impacted soils in the lagoon	e/	cy	470	\$10	\$4,700
d. Backfill (excavated soils)	f/	cy	190	\$4	\$760
e. Backfill (clean/imported soil)	g/	cy	280	\$10	\$2,800
f. Load (sludge/waste and impacted soils)	h/	cy	240	\$3	\$720
g. Haul/Handling of Soils/Staging (on-site)	h/	cy	240	\$3	\$720
h. Decon Water/DW Transportation & Disposal (non-hazardous)	i/	gal	200	\$1	\$200
i. Confirmatory soil sampling/analysis	j/	ea	10	\$280	\$2,800
j. Asphalt pavement on top of the former lagoon	k/	sy	210	\$25	\$5,250
k. Miscellaneous/Warning Signs/Equipment Rental/Lighting/Site Cleanup		ls	1	\$500	\$500
l. Site survey/as-builts		ls	1	\$1,000	\$1,000
m. Site Cleanup		ls	1	\$1,000	\$1,000
Subtotal Excavation Costs					\$28,000
n. Off-Site Disposal of Non-Hazardous Soils (includes transportation & disposal)	v/	Ton	360	\$50	\$18,000
o. Contingency (20% of Excavation and Disposal Costs)					\$9,200
Total Excavation and Off-Site Disposal Costs					\$55,200
Present Worth of Construction Costs (Year 1) (assumed to be disbursed in Year 2)	c/				\$51,600
III. Construction Services					
1. Engineering/Construction/Excavation Oversight	m/	ls	1	\$5,600	\$5,600
2. Construction/Excavation Completion Report	n/	ls	1	\$10,000	\$10,000
3. Health and Safety Monitoring Instruments		ls	1	\$500	\$500
4. Project Management/Coordination	a/	ls	1	\$1,800	\$1,800
Subtotal Construction Services Costs					\$17,900
5. Contingency (20% of Construction Services Costs)					\$3,580
Total Construction Services Costs					\$21,480
Present Worth Construction Services Costs (Year 2) (assumed to be disbursed in Year 2)	b/				\$20,100
PRESENT WORTH OF TOTAL PROBABLE COSTS	b/				\$143,400

Notes and Major Assumptions:

- a/ Project management and coordinating project related activities.
- b/ Assumes 3 phases of remedial design submittal to USEPA.
- c/ Present worth costs were estimated based on a net annual discount rate of 7%, assuming year-end distribution, rounded to the nearest \$100.
- d/ Lump sum costs based on similar projects.
- e/ Excavation of sludge/waste and impacted soils (45' x 35' x 8') from the former lagoon that exceed human health target risk.
- f/ Backfill with excavated soils containing COCs below RGs.
- g/ Imported soil for backfilling excavated lagoon (assumes using upper 4 ft of excavated soils for backfilling). Assumed additional 20% soils for site regrading.
- h/ Load soils on trucks for transportation (assumes impacted soil/sludge 4 ft thick); handling of soils including transportation onsite and stockpiling.
- i/ Assumes decontamination water is non-hazardous.
- j/ Assumes confirmation soil sampling at 20'x20' grid (1 comp. Sample/grid) and 4 samples from the side walls plus 2 QA/QC.
- k/ Assumes cost for the asphalt pavement on top of the lagoon.
- v/ Assumes sludge/soil to be non-hazardous and hauled away and disposed at a local Subtitle D facility.
- m/ Labor and expenses to oversee and direct the excavation contractor and collecting confirmation soil samples by a full-time personnel (assumed to take 1 week).
- n/ A removal action report will be submitted to USEPA.
- Estimates are based on information currently available and on assumptions listed in this report.
- Costs are based on vendor information, contractors' estimate, cost estimation manuals, and past experience.
- Abbreviations: ea = each; ls = lump sum; hr = hours; cy = cubic yards; lf = linear feet; Gal = gallons; wk = week; bls = below land surface.
- Total Costs are rounded to nearest \$10 and the present worth costs are rounded to nearest \$100.

Table 5-3
Opinion of Probable Costs for Capping of Equalization Lagoon Sludge (Alternative S3)
Feasibility Study
Admiral Home Appliances Site
Williston, South Carolina

Description	Notes	Unit	Est. Quantity	Unit Cost (\$)	Total Cost
I. Design Services					
1. Project Management/Coordination	a/	ls	1	\$3,400	\$3,400
2. Remedial Design Reports (30%, 60% & 100%)	b/	ls	1	\$25,000	\$25,000
3. Contract Documents/Construction Plans/Specifications/HASP		ls	1	\$3,500	\$3,500
4. Prebid meeting/contractor selection/contracting/planning		ls	1	\$2,000	\$2,000
Subtotal Design Services Costs					\$33,900
5. Contingency (20% of Design Services Costs)					\$6,780
Total Design Services Costs					\$40,680
Present Worth Design Services Costs (Year 1) (assumed to be disbursed in Year 1)	c/				\$38,000
II. Engineering Services					
1. Preparation for Deed Restriction		ls	1	\$10,000	\$10,000
2. Surveying		ls	1	\$5,000	\$5,000
3. Project Management/Coordination		ls	1	\$1,300	\$1,300
Subtotal Engineering Services Costs					\$16,300
4. Contingency (20% of Engineering Services Costs)					\$3,260
Total Engineering Services Costs					\$19,560
Present Worth Engineering Services Costs (Year 1) (assumed to be disbursed in Year 2)	c/				\$17,100
IV. Maintenance					
1. Routine asphalt maintenance (Annual)	d/	ls	1	\$1,000	\$1,000
2. Periodic Inspection /Report Preparation	e/	ls	1	\$1,200	\$1,200
3. Contingency (20% of Maintenance Costs)					\$200
Present Worth Maintenance Costs (Years 30) (assumed to be disbursed in Years 2 - 31)	c/				\$27,800
PRESENT WORTH OF TOTAL PROBABLE COSTS	c/				\$91,500

Notes and Major Assumptions:

- a/ Project management and coordinating all project related activities.
- b/ Assumes 3 phases of remedial design submittal to USEPA.
- c/ Present worth costs were estimated based on a net annual discount rate of 7%, assuming year-end distribution, rounded to the nearest \$100.
- d/ Periodic maintenance/patching
- e/ Annual inspection/reporting to Agency.
- Estimates are based information currently available and on assumptions listed in this report.
- Costs are based on vendor information, contractors' estimate, cost estimation manuals, and past experience.
- Abbreviations: ea = each; ls = lump sum; hr = hours; cy = cubic yards; lf = linear feet; Gal - gallons; wk = week; bls = below land surface.
- Total Costs are rounded to nearest \$10 and the present worth costs are rounded to nearest \$100.

Table 5-4
Opinion of Probable Costs for On-Site Stabilization/Solidification and Capping of Equalization Lagoon sludge (Alternative S4)
Feasibility Study
Admiral Home Appliances Site
Williston, South Carolina

DESCRIPTION	NOTES	UNITS	QTY	Unit Cost (\$)	Total Cost
I. Design Services					
1. Project Management/Coordination	a/	ls	1	\$1,400	\$1,400
2. Remedial Design Reports (30%, 60% & 100%)	b/	ls	1	\$50,000	\$50,000
2. Contract Documents/Construction Plans/Specifications/HASP		ls	1	\$10,000	\$10,000
3. Prebid meeting/contractor selection/contracting/planning		ls	1	\$3,000	\$3,000
Subtotal Design Services Costs					\$64,400
4. Contingency (20% of Design Services Costs)					\$12,880
Total Design Services Costs					\$77,280
Present Worth Design Services Costs (Year 1) (assumed to be disbursed in Year 1)	c/				\$72,200
II. Construction Costs					
1. Excavation and On-Site (Stabilization)					
a. Mobilization/Demobilization		ls	1	\$10,000	\$10,000
b. Site Preparation/Asphalt Removal/Decor/Staging Areas Setup	d/	ls	1	\$15,000	\$15,000
c. Excavation of sludge/waste and impacted soils in the lagoon	e/	cy	470	\$10	\$4,700
c. Stabilization of Sludge/waste	f/	cy	230	\$50	\$11,500
d. Backfill (on-site soils)	g/	cy	470	\$3.50	\$1,650
e. Off-Site Disposal of Excess Soils (un-impacted)	h/	cy	90	\$10	\$900
e. Load (unimpacted soils for off-site disposal)	i/	cy	240	\$3	\$720
f. Haul/Handling of Soils/Staging (on-site)		cy	470	\$3	\$1,410
h. Decon Water/IDW Transportation & Disposal (non-hazardous)		gal	250	\$1	\$250
i. Confirmatory soil sampling/analysis	j/	ea	10	\$280	\$2,800
j. Asphalt pavement on top of the excavated area		sy	210	\$25	\$5,250
h. Miscellaneous/Warning Signs/Equipment Rental/Lighting/Site Cleanup		ls	1	\$250	\$250
i. Site survey/as-built		ls	1	\$1,500	\$1,500
Subtotal Excavation and Treatment Costs					\$55,900
s. Contingency (20% of Excavation and Treatment Costs)					\$15,400
Total Excavation and Treatment Costs					\$92,380
Present Worth of Construction Costs (assumed to be disbursed in Year 2)	d/				\$92,400
III. Construction Services					
1. Engineering/Construction Oversight	k/	ls	1	\$11,200	\$11,200
2. Construction Completion Report	l/	ls	1	\$10,000	\$10,000
3. Health and Safety Monitoring Instruments		ls	7	\$500	\$3,500
4. Project Management/Coordination		ls	1	\$7,500	\$7,500
Subtotal Construction Services Costs					\$32,200
6. Contingency (20% of Construction Services Costs)					\$6,440
Total Construction Services Costs					\$38,640
Present Worth Construction Services Costs (assumed to be disbursed in Year 2)	d/				\$33,700
IV. Maintenance					
1. Routine asphalt cap maintenance	m/	ls	1	\$500	\$500
2. Periodic Inspection /Report Preparation	n/	ls	1	\$1,200	\$1,200
3. Contingency (20% of Maintenance Costs)					\$100
					\$1,800
Present Worth Maintenance Costs (30 Years) (assumed to be disbursed in Years 2 - 31)	d/				\$20,900
PRESENT WORTH OF TOTAL PROBABLE COSTS	d/				\$218,200

Notes and Major Assumptions:

- a/ Project management and coordinating all project related activities.
- b/ Remedial design reports preparation including stabilization/solidification mix design.
- c/ Present worth costs were estimated based on a net annual discount rate of 7%, assuming year-end distribution.
- d/ Lump sum costs based on similar projects.
- e/ Excavation of sludge/waste and impacted soils from the former lagoon that exceed human health target risk (45'x35'x8').
- f/ Stabilize/solidify sludge/waste/soils (35'x45'x4') on-site (abovegrade) for returning it to excavation.
- g/ Backfill stabilized/solidified waste material and excavated soils (below PRGs).
- h/ Off-site disposal of unimpacted soils (excess soils due to bulking of stabilized waste); soils can be used for off-site construction work.
- h/ Assume construction equipment be decontaminated 25 times and use around 100 gals/decon; decon water disposed as non-hazardous waste.
- i/ Load soils on to truck for off-site disposal
- j/ Assumes confirmation soil sampling at 20'x20' grid (1 comp. Sample/grid) and 4 samples from the side walls plus 2 QA/QC.
- k/ Labor and expenses to oversee and direct the excavation contractor and collecting confirmation soil samples by a full-time personnel (assumed to take 2 weeks).
- l/ A removal action report will be submitted to EPA.
- m/ Assumes soils to be non-hazardous and hauled away and disposed at Okeechobee facility (disposal facility for Yr. 2000 removal action).
- n/ Periodic maintenance/patching
- m/ Annual inspection/reporting to Agency.
- Estimates are based information currently available and on assumptions listed in this report.
- Costs are based on vendor information, contractors' estimate, cost estimation manuals, and past experience.
- Abbreviations: ea = each; ls = lump sum; hr = hours; cy = cubic yards; lf = linear feet; Gal = gallons; wk = week; bls = below land surface.
- Total Costs are rounded to nearest \$10 and the present worth costs are rounded to nearest \$100.

Table 5-5

DESCRIPTION	NOTES	UNITS	QTY	UNIT COST (\$)	TOTAL COST (\$)
I. No Action Determination					
1. Project Management/Coordination	a/	ls	1	\$3,960	\$4,000
2. Baseline Groundwater Sampling - Analytical Costs	b/	ea	46	\$150	\$6,900
3. Baseline Groundwater Sampling - Labor		ls	1	\$16,700	\$16,700
4. Equipment Rental/Field Expenses		ls	1	\$2,000	\$2,000
5. Baseline Groundwater Sampling Report		ls	1	\$10,000	\$10,000
Subtotal Baseline Costs					\$39,600
6. Contingency (20% of Total Baseline Costs)					\$7,900
Total Baseline Costs					\$47,500
Present Worth (PW) of Total Baseline Costs (Year 1)					\$44,400
II. Mandated Five-Year Review					
1. 5-Year CERCLA Review Groundwater Sampling	d/	ls	1	\$30,000	\$30,000
2. 5-Year CERCLA Review Sampling Report		ls	1	\$15,000	\$15,000
3. Regulatory Meeting/Negotiation		ls	1	\$5,000	\$5,000
Subtotal Five-Year Review Costs					\$50,000
4. Contingency (20% of Five-Year Review Costs)					\$10,000
Total Five-Year Review Costs					\$60,000
Present Worth of Total Five-Year Review Costs over for 30 Years (6 events)					\$129,500
PW OF TOTAL PROBABLE COSTS					\$173,900

- a/ Project management and coordinating all project related activities.
- b/ Assumes sampling of 30 monitoring wells, 10 water supply wells, plus 6 QA/QC for VOCs (8260) and selected metals.
- c/ Present worth based on rate of 7%, assuming year-end distribution.
- d/ Includes labor and laboratory costs and expenses for groundwater samples similar that listed in Note b.
- Abbreviations: ls = lump sum, ea = each, hr = hour

Table 5-6
Opinion of Probable Costs for Monitored Natural Attenuation (Groundwater Alternative GW2)
Record of Decision
Admiral Home Appliances Site
Williamston, South Carolina

DESCRIPTION	NOTES	UNITS	QTY	UNIT COST (\$)	TOTAL COST (\$)
I. Pre-design Services					
1. Project Management/Coordination	a/	ls	1	\$5,600	\$5,600
2. Groundwater Sampling (labor and lab)	b/	ls	1	\$30,000	\$30,000
3. Remedial Design Work Plan (Groundwater)		ls	1	\$20,000	\$20,000
Subtotal Pre-design Services Costs					\$55,600
B. Contingency (20% of Pre-design Services Costs)					\$11,120
Total Pre-design Services Costs					\$66,720
Present Worth (PW) of Total Pre-design Costs (Payment Year 1)					\$63,500
II. Design Services					
1. Project Management/Coordination	a/	ls	1	\$17,800	\$17,800
2. Remedial Design (30%, 60%, 100%)	b/	ls	1	\$75,000	\$75,000
3. Groundwater Modeling (Fate and Transport)	d/	ls	1	\$75,000	\$75,000
4. Regulatory Meetings/Negotiations		ls	1	\$10,000	\$10,000
Design Services Costs					\$177,800
4. Contingency (20% of Design Services Costs)					\$35,600
Total Design Services Costs					\$213,400
PW of Total Design Costs (Payment Year 1)					\$199,400
III. MNA Monitoring Costs					
Year 1 Monitoring					
1. Quarterly Groundwater Monitoring (30 monitoring wells - 10 water supply wells - 6 QA/QC samples)					
a. Project Management/Coordination	a/	ls	1	\$17,100	\$17,100
b. Additional Groundwater Monitoring Wells Installation	a/	ea	6	\$2,625	\$15,750
c. IDW Disposal (drilling cuttings/non-hazardous - 5 drums/well)		ea	30	\$100	\$3,000
d. Labor - sampling wells (quarterly)	l/	ea	4	\$12,000	\$48,000
e. Analyticals: EPA 8260 (monitoring & water supply wells)	g/	ea	154	\$120	\$18,480
f. Analyticals: Biogeochemical Parameters (20 samples)	g/	ea	80	\$350	\$28,000
g. Equipment rental/Reimbursable		ea	4	\$2,000	\$8,000
h. Monitoring report to Agency (semi-annually)		ea	2	\$15,000	\$30,000
i. Regulatory Negotiations/Meetings		ls	1	\$3,000	\$3,000
Subtotal Annual O&M and Monitoring Cost (Year 1)					\$171,300
2. Contingency (20% of Annual O&M and Monitoring Costs)					\$34,300
Total Annual O&M and Monitoring Cost (Year 1)					\$205,600
PW of Quarterly Monitoring Costs (Year 1) (Payment Year 2)					\$179,600
Years 2 through 16 (Semi-Annual Natural Attenuation Monitoring)					
a. Project Management/Coordination	a/	ls/yr	1	\$8,300	\$8,300
b. Labor - sampling wells	l/	ea	2	\$12,000	\$24,000
c. Analyticals: EPA 8260 (monitoring & water supply wells)	g/	ea	82	\$120	\$9,840
d. Analyticals: Biogeochemical Parameters (20 samples semiannually)	g/	ea	40	\$350	\$14,000
e. Equipment rental/Reimbursable		ea	2	\$2,000	\$4,000
f. Monitoring report to Agency (semi-annually)		ls	2	\$10,000	\$20,000
g. Regulatory Negotiations/Meetings		ls	1	\$3,000	\$3,000
Subtotal Annual Monitoring Costs					\$83,100
B. Contingency (20% of Annual Monitoring Costs)					\$16,620
Total Annual Monitoring Costs					\$99,700
PW of Semi-Annual Monitoring Costs (Years 2-16) (Payment Years 3-16)					\$781,600
Years 16 through 30 (Annual Natural Attenuation Monitoring)					
a. Project Management/Coordination	a/	ls/yr	1	\$4,400	\$4,400
b. Labor - sampling wells	l/	ea	1	\$12,000	\$12,000
c. Analyticals: EPA 8260 (monitoring & water supply wells)	g/	ea	46	\$120	\$5,520
d. Analyticals: Biogeochemical Parameters (20 samples annual)	g/	ea	20	\$350	\$7,000
e. Equipment rental/Reimbursable		ea	1	\$2,000	\$2,000
f. Monitoring report to Agency (annual)		ls	1	\$10,000	\$10,000
g. Regulatory Negotiations/Meetings		ls	1	\$3,000	\$3,000
Subtotal Annual Monitoring Costs					\$43,900
B. Contingency (20% of Annual Monitoring Costs)					\$8,780
Total Annual Monitoring Costs					\$52,700
PW of Annual Monitoring Costs (Years 16-30) (Payment Years 17-31)					\$162,600
IV. Decommissioning Costs					
a. Project Management/Coordination	a/	ls	1	\$5,300	\$5,300
b. Abandon Extraction and Monitoring Wells	b/	lf	3000	\$6	\$18,000
c. Labor/expense		ls	1	\$8,800	\$8,800
d. Regulatory Negotiations/Meetings		ls	1	\$5,000	\$5,000
e. Closure Report		ls	1	\$10,000	\$10,000
Subtotal Closure Costs					\$47,200
2. Contingency (20% of Annual Monitoring Costs)					\$9,440
Total Annual Monitoring Costs					\$56,640
PW of Decommissioning Costs (Year 30) (distribution in Yr. 32)					\$6,500
PW OF TOTAL PROBABLE COSTS					\$1,373,200

Notes:

- a/ Project management and coordinating all project related activities.
- b/ Groundwater sampling prior to assess groundwater conditions (30 monitoring wells) during remedial design work plan preparation.
- c/ Present worth based on a rate of 7%, assuming year-end distribution.
- d/ Groundwater fate and transport modeling in support of the monitored natural attenuation (MNA) remedy design.
- e/ Installation of 6 additional monitoring wells for performance monitoring.
- f/ Assumes 6 days to sample by 2 fulltime technicians and includes travel expenses.
- g/ Sampling of 30 MWs and 10 water supply wells plus 6 QA/QC samples for VOCs EPA Method 8260; 20 samples will be analyzed for selected biogeochemical parameters.
- h/ Assumes in-place abandonment of monitor wells (grouting).
- i/ Costs are based on vendor information, contractors' estimate, cost estimation manuals, and past experience.
- Abbreviations: ea = each; ls = lump sum; lf = linear foot; Gai = gallons; wk = week; yr = year;

Table 5-7
Opinion of Probable Costs to Install and Operate a Groundwater Extraction System (Alternative GW3)

Record of Decision
Admiral Home Appliances Site
Williston, South Carolina

DESCRIPTION	NOTES	UNITS	QTY	UNIT COST (\$)	TOTAL COST (\$)
I. Predesign Services					
1. Project Management/Coordination	a/	ls	1	\$6,100	\$6,100
2. Groundwater Sampling (labor and lab)	b/	ls	1	\$30,000	\$30,000
3. Remedial Design Work Plan (Groundwater)		ls	1	\$25,000	\$25,000
Subtotal Predesign Services Costs					\$61,100
4. Contingency (20% of Predesign Services Costs)					\$12,200
Total Predesign Services Costs					\$73,300
Present Worth (PW) of Total Predesign Costs (Distribution in Year 1)	c/				\$68,500
II. Design Services					
1. Project Management/Coordination	a/	ls	1	\$21,100	\$21,100
2. Pump/Aquifer Test		ls	1	\$30,000	\$30,000
3. Remedial Design Reports (Groundwater - 30%, 60% & 100%)		ls	1	\$100,000	\$100,000
4. Groundwater Modeling (Flow)	d/	ls	1	\$40,000	\$40,000
5. Design/Contract Documents Preparation/HASP	e/	ls	1	\$10,000	\$10,000
6. Regulatory Negotiations/Meetings		ls	1	\$5,000	\$5,000
7. Access Agreement/Negotiations/Permitting	f/	ls	1	\$30,000	\$30,000
8. Pre-bid Meeting/Contractor Selection/Contracting		ls	1	\$5,000	\$5,000
Design Services Costs					\$241,100
9. Contingency (20% of Design Services Costs)		ls	1	\$48,200	\$48,200
Total Design Services Costs					\$289,300
PW of Total Design Services Costs (Distribution in Year 1)	c/				\$270,400
III. Construction and Startup Costs					
1. Construction Costs					
1. Mobilization/Demobilization/Setup		ls	1	\$15,000	\$15,000
2. Site Clearance/Temporary Road Construction	g/	ls	1	\$20,000	\$20,000
3. Groundwater Extraction Wells Installation (32 wells)	h/	ea	32	\$5,250	\$168,000
4. Additional Groundwater Monitoring Wells Installation	h/	ea	6	\$2,625	\$15,750
5. IDW Disposal (drilling cuttings/non-hazardous)		cy	85	\$55	\$4,680
6. Extraction Well vaults (abovegrade) and guardposts		ea	32	\$810	\$25,920
7. Extraction Well pumps and Level Switches	i/	ea	32	\$2,320	\$74,240
8. Well Head Fittings, and Valves, and Instrumentation	j/	ea	32	\$750	\$24,000
9. Trenching (for groundwater recovery pipe installation)	k/	lf	3500	\$25	\$87,500
10. Backfilling trenches	k/	cy	520	\$10	\$5,200
11. Extraction piping	l/	ls	1	\$20,880	\$20,880
12. Effluent piping installation	m/	ls	1	\$20,880	\$20,880
13. Jack-and-bore under road (piping under Dixie Narco Blvd.)		ls	1	\$22,820	\$22,820
14. Airstripper (tray stripper - 130 gpm capacity)	o/	ea	1	\$24,800	\$24,800
15. Carbon Polishing Units	o/	ls	1	\$12,200	\$12,200
16. Ion-Exchange Units	o/	ls	1	\$75,000	\$75,000
17. As-built survey		ls	1	\$10,000	\$10,000
18. Site Cleanup/Restoration		ls	1	\$5,000	\$5,000
19. Building for housing treatment system w/HVAC and Lighting		ea	1	\$100,000	\$100,000
20. Electrical hookup/wiring	p/	ls	1	\$25,000	\$25,000
21. Electrical Control Panel (groundwater extraction/treatment system)		ls	1	\$35,000	\$35,000
Subtotal Construction Costs					\$791,870

2. Baseline Sampling and System Startup

a. Project Management/Coordination	a/	ls	1	\$3,800	\$3,800
b. Labor - sampling wells/Startup		ls	1	\$32,000	\$32,000
c. Analyticals: (30 Wells+32 Ews+ 10 supply wells+6 QA/QC)	v/	ea	78	\$150	\$11,700
d. Analyticals: Biogeochemical/MNA Parameters (15 samples)	w/	ea	15	\$350	\$5,250
d. Equipment rental		ea	1	\$2,000	\$2,000

Subtotal Baseline Sampling & Startup

\$54,800

3. Engineering Services

1. Record Drawings/Construction Report/O&M Manual		ls	1	\$40,000	\$40,000
2. Engineering Oversight (labor and expenses)	r/	ls	1	\$57,000	\$57,000
3. System startup/shake down		ls	1	\$25,000	\$25,000
4. Project Management/Coordination	a/	ls	1	\$18,300	\$18,300

Subtotal Engineering Services Costs

\$140,300

3. Contingency (20% of Capital Costs)

\$197,390

Total Construction and Startup Cost

\$1,129,560

PW of Construction and Startup Cost

\$986,600

(distribution in Yr.2)

IV. Operation, Maintenance, and Monitoring (OMM) Costs

1. System O&M (Yr.1 through 30)

a. Project Management/sub oversight	a/	ls	1	\$14,800	\$14,800
b. System O&M Labor/expenses	s/	ea	28	1,350	\$37,800
c. Electrical Power	v/	kw-hr	342,170	\$0.10	\$34,220
d. Carbon Replacement	u/	ls	1	\$3,550.00	\$3,600
e. Ion Exchange Units	u/	ls	1	\$50,000	\$50,000
f. Equipment Repair/Replacement		ls	1	\$2,500	\$2,500
g. Data review/engineering support		ea	12	1,340	\$16,080
h. Quarterly Reporting for NPDES Permit		ea	4	\$1,000	\$4,000

Subtotal Annual O&M Cost

\$163,000

2. Semi-annual Groundwater Monitoring (30 MWs + 32 EWs + 10 supply wells + 6 QA/QC samples)

a. Project Management/Coordination	a/	ls	1	\$10,100	\$10,100
b. Labor - sampling wells (semi-annually)	v/	ea	2	\$32,000	\$64,000
c. Analyticals: VOCs and selected metals	v/	ea	146	\$150	\$21,900
d. Analyticals: (monthly treatment effluent)	v/	ea	12	\$150	\$1,800
e. Effluent Toxicity Testing/NPDES Sampling (quarterly)		ea	4	\$150	\$600
f. Analyticals: Biogeochemical Parameters (15 samples semiannually)	w/	ea	30	\$350	\$10,500
g. Equipment rental (semi-annually)/Reimbursable		ea	2	\$2,000	\$4,000
h. Monitoring report to Agency (semi-annually)		ls	2	\$10,000	\$20,000
i. Regulatory Negotiations/Meetings		ls	1	\$3,000	\$3,000

Subtotal Semi-annual Monitoring Cost (annual)

\$135,900

3. Contingency (20% of Annual O&M and Monitoring Costs)

\$59,780

Total Annual OMM Cost

\$358,680

PW of Annual OMM for Years 1 thru' 30

\$4,159,700

(distribution in Yrs.2 thru' 32)

V. Decommissioning Costs

1. a. Project Management/Coordination	a/	ls	1	\$12,000	\$12,000
b. Abandon Extraction Pumps/discharge piping	x/	ls	1	\$20,000	\$20,000
c. Abandon Extraction and Monitoring Wells	x/	lf	4650	\$6	\$27,900
d. Labor/expenses		ls	1	\$8,890	\$8,890
e. Regulatory Negotiations/Meetings		ls	1	\$5,000	\$5,000
f. Closure Report		ls	1	\$10,000	\$10,000
Subtotal Closure Costs					\$83,800
2. Contingency (20% of Annual Monitoring Costs)					\$16,760
Total Annual Monitoring Costs					\$100,560
PW of Decommissioning Costs (Years 30) (distribution in Yr. 32)					\$11,500
PW OF TOTAL PROBABLE COSTS					\$5,496,700

Notes/Assumptions:

- a/ Project management and coordinating all project related activities.
- b/ Groundwater sampling prior to assessing groundwater conditions (30 monitoring wells) during remedial design work plan preparation.
- c/ Present worth costs were estimated based on a net annual discount rate of 7%, assuming year-end distribution.
- d/ Groundwater flow modeling for the remedial system design.
- e/ Finalizing design and preparation of contract documents for bidding.
- f/ Access agreement for offsite recovery wells installation; NPDES permitting; erosion & sedimentation control plan/permitting.
- g/ Site clearance (tree clearance and temporary gravel road for drill rig mobilization).
- h/ Assume 32 Extraction Wells (EW) will be required in the TCE and CT plumes. Wells constructed of 6-in diameter PVC casing and screen to an average depth of 75 feet. Also, assumes 6 additional monitoring wells installation for performance monitoring.
- i/ Probable cost for a electric submersible pump with level controls. Assume pumps to operate continuously at 0.75 BHP and 70% efficiency.
- j/ Instrumentation includes gauges and totalizer for flow recording.
- k/ Shallow trenching (2 ft deep) for recovery well piping and discharge piping (assumed to be a total of 3500 ft). Use excavated soil for backfilling.
- l/ Assumes 2" dia. PVC/HDPE piping for extracting groundwater to a treatment system.
- m/ Effluent piping to stream (assumes 4-inch dia. PVC pipe)
- n/ Shallow tray air stripper (130 gpm capacity); 2500 lbs of liquid phase carbon in carbon adsorbers; and ion exchange units for metals/inorganics treatment
- p/ Electrical hookup to extraction wells, treatment system and treatment building including power drop.
- r/ Assumes 12 weeks for installation. Includes labor and expenses for a full-time construction oversight and project management/coordination.
- s/ Assumes one-day visits, twice a month plus 4 contingent visits by a qualified technician.
- t/ Assumes 0.75 hp/extraction pump, 15 hp for air stripper blower, and 2 x 3 hp transfer pumps operating at 70% efficiency and \$0.1/kw-hr utility cost.
- u/ Assumes 3,000 lbs of GAC replacement and that of ion exchange resin replacement.
- v/ Sampling of 30 MWs, 32 Ews & 10 supply wells plus 6 QA/QC samples for VOCs and selected metals. Assumes 3 weeks to sample by 2 time technicians plus travel related expenses.
- w/ Analysis of 15 samples for biogeochemical parameters for MNA.
- x/ Assumes in-place abandonment of recovery & monitor wells and discharge piping (no excavation/removal).
 - The recovery system is assumed to be operated for approximately 30 years.
 - Contingency used for each item varies and is based on information available at the time of preparing these costs and previous with similar projects.
 - Costs are based on vendor information, contractors' estimate, cost estimation manuals, and past experience. Actual costs can vary depending upon the final design and project/site conditions.
 - Abbreviations: ea = each; ls = lump sum; hr = hours; CY = cubic yards; LF = linear feet; Gal = gallons; wk = week;
 - Total Costs are rounded to nearest \$10 and the present worth costs are rounded to nearest \$100.

Table 5-8
Opinion of Probable Costs for Enhanced Reductive Dechlorination (Alternative GW4)
Record of Decision
Admiral Home Appliances Site
Williston, South Carolina

DESCRIPTION	NOTES	UNITS	QTY	UNIT COST (\$)	TOTAL COST (\$)
I. Predesign Services					
1. Project Management/Coordination	a/	ls	1	\$6,100	\$6,100
2. Groundwater Sampling (labor and lab)	b/	ls	1	\$30,000	\$30,000
3. Remedial Design Work Plan (Groundwater)		ls	1	\$25,000	\$25,000
Subtotal Predesign Services Costs					\$61,100
5. Contingency (20% of Predesign Services Costs)					\$12,200
Total Predesign Services Costs					\$73,300
Present Worth (PW) of Total Predesign Costs	c/				\$68,500
Payment Year 1					
II. Design Services					
1. Project Management/Coordination	a/	ls	1	\$14,000	\$14,000
2. Remedial Design Reports (Groundwater - 30%, 60% & 100%)		ls	1	\$75,000	\$75,000
3. Field Scale Pilot Study	d/	ls	1	\$75,000	\$75,000
4. Design/Contract Documents Preparation/HASP	e/	ls	1	\$7,500	\$7,500
5. Regulatory Negotiations/Meetings		ls	1	\$5,000	\$5,000
6. Access Agreement/Negotiations/Permitting	f/	ls	1	\$30,000	\$30,000
7. Pre-bid Meeting/Contractor Selection/Contracting		ls	1	\$3,500	\$3,500
8. Regulatory Meetings/Negotiations		ls	1	\$5,000	\$5,000
Design Services Costs					\$215,000
9. Contingency (20% of Design Services Costs)					\$43,000
Total Design Services Costs					\$258,000
PW of Total Design Costs	c/				\$225,300
Payment Year 1					
III. Capital Costs					
1. Construction Costs					
a Mobilization/Demobilization		ls	1	\$2,500	\$2,500
b Site Clearance/Temporary Road Construction	g/	ls	1	\$20,000	\$20,000
c Injection well installation	h/	ea	250	\$2,625	\$656,250
d Injection System (portable mixing tank/storage/pumps/piping)	i/	ls	1	\$35,000	\$35,000
e Additional Groundwater Monitoring Wells Installation	j/	ea	6	\$2,625	\$15,750
f IDW disposal		ea	260	\$55	\$14,300
Subtotal Construction Costs					\$743,800
2. Baseline Sampling and System Startup					
a. Project Management/Coordination	a/	ls	1	\$2,200	\$2,200
b. Labor - sampling wells		ls	1	\$14,000	\$14,000
c. Analyticals: EPA 8260 (30 Wells+ 10 supply wells + 6 QA/QC)	k/	ea	46	\$120	\$5,520
d. Analyticals: Biogeochemical Parameters (20 samples)	k/	ea	20	\$350	\$7,000
d. Equipment rental/Reimbursable		ea	1	\$1,500	\$1,500
Subtotal Baseline Sampling & Startup					\$30,200
3. Engineering Services					
1. Record Drawings/Construction Report/O&M Manual		ls	1	\$25,000	\$25,000
2. Engineering Oversight (labor and expenses)	l/	ls	1	\$23,000	\$23,000
3. Project Management/Coordination	a/	ls	1	\$4,800	\$4,800
Subtotal Engineering Services Costs					\$52,800
3. Contingency (20% of Installation Costs)					\$165,360
Total Construction and Startup Cost					\$939,360
PW of Construction and Startup Cost	c/				\$820,500
(distribution in Yr.2)					

III. Operation and Maintenance (O&M) and Monitoring Costs

Year 1 O&M

1. O&M - ERD (biweekly)					
a. Project Management/sub oversight/troubleshooting	a/	ls	1	\$22,900	\$22,900
b. Carbon Source (assumes corn syrup for pricing purposes)	m/	gal	65,000	\$2.00	\$130,000
c. Potable Water	m/	gal	585,000	\$0.010	\$5,900
d. O&M labor	n/	hr	3900	\$40	\$156,000
e. Piping/Fittings/Mixing Tank/Pump		ls	1	\$1,000	\$1,000
f. Truck Rental	o/	ea	26	\$300	\$7,800
g. Project Expenses (gasoline/per diem)		ls	1	\$1,000	\$1,000
h. Engineering Support/Data Review		ea	4	\$8,700	\$34,800
2. Quarterly Groundwater Monitoring (30 wells + 10 water supply wells + QA/QC samples)					
a. Project Management/Coordination	a/	ls	1	\$14,500	\$14,500
b. Labor - sampling wells (quarterly)	p/	ea	4	\$12,000	\$48,000
c. Analyticals: EPA 8260 (quarterly)	q/	ea	154	\$120	\$18,480
d. Analyticals: Biogeochemical Parameters (20 samples)	q/	ea	80	\$350	\$28,000
f. Equipment rental/expenses (quarterly)	r/	ea	4	\$1,500	\$6,000
g. Monitoring report to Agency (semiannual)		ls	2	\$15,000	\$30,000
Subtotal Annual O&M and Monitoring Cost (Year 1)					\$504,400
3. Contingency (20% of Annual O&M and Monitoring Costs)					\$100,900
Total Annual O&M and Monitoring Cost (Year 1)					\$605,300
PW of Annual O&M and Monitoring (Year 1 O&M)					\$528,700
Payment Year 2					

Year 2 - 3 O&M

1. O&M - ERD (monthly)					
a. Project Management/sub oversight/troubleshooting	a/	ls	1	\$17,500	\$17,500
b. Carbon Source (assumes corn syrup for pricing purposes)	m/	gal	30,000	\$2.00	\$60,000
c. Potable Water	m/	gal	270,000	\$0.010	\$2,700
d. O&M labor	n/	hr	1800	\$40	\$72,000
e. Piping/Fittings/Mixing Tank/Pump		ls	1	\$1,000	\$1,000
f. Truck Rental	o/	ea	12	\$300	\$3,600
g. Project Expenses (gasoline/per diem)		ls	1	\$1,000	\$1,000
h. Engineering Support/Data Review		ea	2	\$8,700	\$17,400
2. Semi-annual Groundwater Monitoring (30 wells + 10 water supply wells + QA/QC samples)					
a. Project Management/Coordination	a/	ls	1	\$8,300	\$8,300
b. Labor - sampling wells (semiannual)	p/	ea	2	\$12,000	\$24,000
c. Analyticals: EPA 8260 (semiannual)	q/	ea	82	\$120	\$9,840
d. Analyticals: Biogeochemical Parameters (20 samples semiannual)	q/	ea	40	\$350	\$14,000
f. Equipment rental/expenses (semiannual)	r/	ea	2	\$1,500	\$3,000
g. Monitoring report to Agency (semiannual)		ls	2	\$12,000	\$24,000
Subtotal Annual O&M and Monitoring Cost					\$258,300
3. Contingency (20% of Annual O&M and Monitoring Costs)					\$51,700
Total Annual O&M and Monitoring Cost					\$310,000
PW of Annual O&M and Monitoring (Year 2-3)					\$489,500
Payment Years 3-4					

Year 4 - 5 Groundwater Monitoring

1. Semi-annual Groundwater Monitoring (30 wells + 10 Res. SWs + QA/QC samples)					
a. Project Management/Coordination	a/	ls	1	\$8,300	\$8,300
b. Labor - sampling wells (semiannual)	p/	ea	2	\$12,000	\$24,000
c. Analyticals: EPA 8260 (semiannual)	q/	ea	82	\$120	\$9,840
d. Analyticals: Biogeochemical Parameters (20 samples semiannual)	q/	ea	40	\$350	\$14,000
f. Equipment rental/expenses (semiannual)	r/	ea	2	\$1,500	\$3,000
g. Monitoring report to Agency (semiannual)		ls	2	\$12,000	\$24,000
Subtotal Annual O&M and Monitoring Cost					\$83,100
2. Contingency (20% of Annual O&M and Monitoring Costs)					\$16,600
Total Annual O&M and Monitoring Cost					\$99,700
PW of Annual O&M and Monitoring (Year 4-5)					\$137,500

Years 6 through 10 (Annual Natural Attenuation Monitoring)

1. a. Project Management/Coordination	a/	ls/yr	1	\$4,300	\$4,300
b. Labor - sampling wells (annual)	p/	ea	1	\$12,000	\$12,000
c. Analyticals: EPA 8260 (annual - 30 MWs + 10 Res. SWs + QA/QC)	q/	ea	46	\$120	\$5,520
d. Analyticals: Biogeochemical Parameters (20 samples)	q/	ea	20	\$350	\$7,000
e. Equipment rental/expenses (annual)	r/	ea	1	\$2,000	\$2,000
f. Reporting		ls	1	\$12,000	\$12,000
Subtotal Annual O&M and Monitoring Cost					\$42,800
10. Contingency (20% of Annual O&M and Monitoring Costs)					\$8,600
Total Annual O&M and Monitoring Cost					\$51,400
PW of Annual O&M and Monitoring (Year 6-10)					\$140,400
Payment Years 7 - 11					

IV. Decommissioning Costs

1. a. Project Management/Coordination	a/	ls	1	\$24,700	\$24,700
b. Abandon Extraction and Monitoring Wells	s/	lf	21450	\$6	\$128,700
c. Labor/expenses		ls	1	\$4,720	\$4,720
d. Regulatory Negotiations/Meetings		ls	1	\$5,000	\$5,000
e. Closure Report		ls	1	\$10,000	\$10,000
Subtotal Decommissioning Costs					\$173,100
2. Contingency (20% of Decommissioning Costs)					\$34,620
Total Decommissioning Costs					\$207,720
PW of Decommissioning Costs (Years 30)					\$23,800
(distribution in Yr. 32)					
PW OF TOTAL PROBABLE COSTS					\$2,434,200

Notes/Assumptions:

- a/ Project management and coordinating all project related activities.
- b/ Groundwater sampling prior to assess groundwater conditions (30 monitoring wells) during remedial design work plan preparation.
- c/ Present worth costs were estimated based on a net annual discount rate of 7%, assuming year-end distribution.
- d/ A field scale ERD pilot study to develop design criteria (area of influence, electron donor injection rate, etc.)
- e/ Finalizing design and preparation of contract documents for bidding.
- f/ Access agreement for Injection well permitting; erosion & sedimentation control plan/permitting.
- g/ Site clearance (tree clearance and temporary gravel road for drill rig mobilization).
- h/ Installation of 2-inch diameter PVC injection wells to (75 feet deep) to cover the treatment areas.
- i/ Injection system to include bulk storage (5000-gal) tank, trailer mounted mixing/injection system, pumps and injection piping. Assume setup of storage tank inside the Dixie-Narco facility, so no insulation/heat tracing or foundation would be required for storage tanks.
- j/ Assumes 6 additional monitoring wells installation for performance monitoring.
- k/ Baseline sampling prior to injection system assumes 30 MWs, 10 SWs and QA/QC samples for VOCs; 20 samples will be analyzed for select biogeochemical parameters.
- l/ Assumes 5 weeks for installation of injection wells & mixing system.
- m/ Assumes injection of 100 gallons of 10% solution of electron donor per well per event biweekly during the first year and monthly thereafter.
- n/ Assumes 0.5 hr/well/event mixing injection by a non-technical (unskilled)/trained laborers.
- v/ Assumes \$300 per week rental truck/event.
- p/ Assumes 6 days for sampling by 2 technicians per event plus travel expenses.
- q/ Analysis of groundwater samples from 30 monitoring wells plus 10 water supply wells for VOCs and 20 samples for biogeochemical parameters (performance monitoring)
- r/ Sampling/field equipment rental and reimbursable.
- s/ Assumes in-place abandonment of injection & monitor wells (grouting).
 - Costs are based on vendor information, contractors' estimate, cost estimation manuals, and past experience.
 - Abbreviations: ea = each; ls = lump sum; hr = hours; CY = cubic yards; LF = linear feet; Gal - gallons; wk = week;

Table 5-9
Opinion of Probable Costs for No Action (Sediment, Hydric Soil, and Surface Water Alternative SHSW1)
Record of Decision
Admiral Home Appliances Site
Williston, South Carolina

DESCRIPTION	NOTES	UNIT	QTY	UNIT COST (\$)	TOTAL COST (\$)
I. No Action Determination					
1. Project Management/Coordination	a/	ls	1	\$3,444	\$3,440
2. Baseline Sediment, Hydric Soil and Surface Water Sampling - Analytical Costs	b/	ea	30	\$350	\$10,500
3. Baseline Sediment, Hydric Soil and Surface Water Sampling - Labor	c/	ea	1	\$7,500	\$7,500
4. Equipment Rental/Field Expenses		ls	1	\$3,000	\$3,000
5. Baseline Sampling Report		ls	1	\$10,000	\$10,000
				Subtotal Baseline Costs	\$34,440
6. Contingency (20% of Total Baseline Costs)					\$6,900
				Total Baseline Costs	\$41,340
				Present Worth of Total Baseline Costs (Year 1)	\$38,600
II. Mandated Five-Year Review					
1. 5-Year CERCLA Review Sampling	e/	ls	1	\$24,400	\$24,400
2. 5-Year CERCLA Review Sampling Report		ls	1	\$10,000	\$10,000
3. Regulatory Meeting/Negotiation		ls	1	\$5,000	\$5,000
				Subtotal Five-Year Review Costs	\$39,400
4. Contingency (20% of Five-Year Review Costs)					\$7,880
				Total Five-Year Review Costs	\$47,280
				Present Worth of Total Five-Year Review Costs over for 30 Years (6 events)	\$102,000
				TOTAL PRESENT WORTH COSTS	\$140,600

Notes:

- a/ Project management and coordinating all project related activities.
- b/ Assumes sampling of 26 stations (6 sediment, 10 hydric soil, 10 surface water), plus 4 QA/QC. - Metals (total and dissolved) + Geochemical and Field Parameters
- c/ Assume 2 technicians for 3 days to do the sampling plus travel related expenses.
- d/ Present worth based on rate of 7%, assuming year-end distribution normalized to year-beginning.
- e/ Includes labor and laboratory costs and expenses for sampling similar to that listed in Note b.
 - Estimates are based on information currently available and on assumptions listed in this report.
 - Costs are based on vendor information, contractors' estimate, cost estimation manuals, and past experience.
 - Abbreviations: ls = lump sum, ea = each

Table 5-10
Summary Statistics for Current and Post Excavation Conditions Within Imhoff System Wetland and Comparison Against Toxicity-Based PRGs

Record of Decision
Admiral Home Appliances
Williston, South Carolina

Chemical	Number of Observations	Concentration (mg/kg)					UCL	PRG (mg/kg)	
		Minimum	Maximum	Mean	Median	SD	Value	Sediment	Hydric Soil
CURRENT CONDITIONS									
Chromium	94	1.8	10423	950	132.5	1839	2,837	250 - 450	450 - 625
Nickel	94	1.2	8720	512	97.1	1310	2,271	150 - 250	500 - 1100
Zinc	94	2.7	59317	2589	306.5	8539	12,159	450 - 600	1400 - 1500
POST EXCAVATION CONDITIONS									
Chromium	94	1.8	1245	63	7.4	164	169	250 - 450	450 - 625
Nickel	94	1.2	355	30	2.7	62	70	150 - 250	500 - 1100
Zinc	94	2.7	814	116	61.8	166	223	450 - 600	1400 - 1500

NOTES:

Current conditions represents concentrations detected within Imhoff System Wetland

Post excavation conditions were calculated by replacing the concentrations within the proposed remedial area with the maximum background concentration in hydric soil or surface soil as listed below:

Chromium 7.4 mg/kg (hydric soil)

Nickel 2.2 mg/kg (hydric soil)

Zinc 61.8 mg/kg (surface soil)

CV - Coefficient of Variation

PRG - Preliminary Remediation Goal

SD - Standard Deviation

UCL - Upper Confidence Limit

1 - 99% Chebyshev (Mean, Sd) UCL

2 - 95% H-UCL

3 - 97.5% Chebyshev (Mean, Sd) UCL

Table 5-11
Opinion of Probable Costs for Removal and Disposal of Sediments and Hydric Soils and Monitored Natural Recovery of
Surface Water Option (Alternative SHSW2)

Record of Decision
Admiral Home Appliances Site
Williston, South Carolina

DESCRIPTION	NOTES	UNIT	QTY	UNIT COST (\$)	TOTAL COST (\$)
I. Design Services					
1. Project Management/Coordination	a/	ls	1	\$19,800	\$19,800
2. Predesign Data Collection /Additional Wetland Survey/Lab Eval.	b/	ls	1	\$34,800	\$34,800
3. Remedial Design Reports (30%, 60% & 100%)	c/	ls	1	\$125,000	\$125,000
4. Contract Documents/Construction Plans/Specifications/HASP		ls	1	\$15,000	\$15,000
5. Prebid meeting/contractor selection/contracting/planning		ls	1	\$3,500	\$3,500
Subtotal Design Services Costs					\$198,100
6. Contingency (20% of Design Services Costs)					\$39,620
Total Design Services Costs					\$237,720
Present Worth Design Services Costs (Year 1) (assumed to be disbursed in Year 1)	d/				\$222,200
II. Construction Costs					
1. Excavation and Off-Site Disposal of Hydric Soils and Sediments					
a. Mobilization/Demobilization		ls	1	\$15,000	\$15,000
b. Site Preparation/Decon/Staging Areas Setup	e/	ls	1	\$40,000	\$40,000
c. Excavation of hydric soils in emergent wetland	f/	cy	400	\$100	\$40,000
d. Forested wetland clearing		sf	74,000	\$3	\$222,000
e. Excavation of hydric soils in forested wetland		cy	2,650	\$100	\$265,000
Excavation of sediments		cy	200	\$50	\$10,000
f. Emergent wetland backfill and restoration	g/	cy	400	\$90	\$36,000
g. Forested wetland backfill and restoration		cy	2,650	\$90	\$238,500
h. Additional planting - trees and shrubs	h/	ea	2,400	\$25	\$60,000
i. Load (impacted hydric soils and sediments)	i/	cy	3,250	\$3	\$9,750
l. Haul/Handling of Hydric Soils and Sediments/Staging (on-site)	j/	cy	3,250	\$3	\$9,750
m. Dewatering of Hydric Soils and Sediments		cy	3,250	\$10	\$32,500
n. Decon Water/IDW Transportation & Disposal (non-hazardous)	j/	gal	20,000	\$1	\$20,000
o. Confirmatory soil and waste sampling/analysis	k/	ea	50	\$250	\$12,500
p. Confirmatory toxicity testing	l/	ea	12	\$2,200	\$26,400
q. Miscellaneous/Warning Signs/Equipment Rental/Lighting/Site Cleanup		ls	1	\$5,000	\$5,000
r. Site survey/as-builts		ls	1	\$3,000	\$3,000
s. Site Cleanup		ls	1	\$5,000	\$5,000
Subtotal Excavation Costs					\$1,050,400
t. Off-Site Disposal of Non-Hazardous Soils (Includes transportation & disposal)	m/	ton	4,880	\$55	\$268,400
u. Contingency (20% of Excavation and Disposal Costs)					\$263,760
Total Excavation and Off-Site Disposal Costs					\$1,582,560
Present Worth of Construction Costs (Year 1) (assumed to be disbursed in Year 2)	d/				\$1,479,000
III. Construction Services					
1. Engineering/Construction/Excavation Oversight	n/	ls	1	\$113,900	\$113,900
2. Construction/Excavation Completion Report	o/	ls	1	\$20,000	\$20,000
3. Health and Safety Monitoring Instruments		ls	1	\$2,000	\$2,000
4. Project Management/Coordination	a/	ls	1	\$15,100	\$15,100
Subtotal Construction Services Costs					\$151,000
5. Contingency (20% of Construction Services Costs)					\$30,200
Total Construction Services Costs					\$181,200
Present Worth Construction Services Costs (Year 1) (assumed to be disbursed in Year 1)	d/				\$169,300

IV. Operation and Maintenance (O&M) Costs

Year 1 - 5 O&M

1. Semiannual Groundwater Monitoring (26 locations + QA/QC)					
a. Project Management/Coordination	a/	ls	1	\$8,022	\$8,000
b. Pre-field setup and mobilization		ea	2	\$1,000	\$2,000
c. Labor - Sampling of soil and surface water stations (semiannual)	p/	ea	2	\$11,600	\$23,200
d. Analyticals: Metals+ Geochemical Parameters	p/	ea	60	\$350	\$21,000
f. Equipment rental/expenses (semiannual)	q/	ea	2	\$3,000	\$6,000
g. Monitoring report to Agency (semiannual)		ls	2	\$10,000	\$20,000
Subtotal Annual O&M and Monitoring Cost					\$80,200
2. Contingency (20% of Annual O&M and Monitoring Costs)					\$16,000
Total Annual O&M and Monitoring Cost					\$96,200
3. Toxicity testing at end of year 1 and year 5	l/	ea	24	\$2,200	\$52,800
Total Annual Cost of Toxicity Testing					\$10,560
Total O&M and Monitoring Cost Annualized					\$106,760
Present Worth of Annual O&M and Monitoring (Year 1-5) Payment Years 2 - 6					\$409,100

Years 6 through 30 (Annual Natural Attenuation Monitoring)

1. a. Project Management/Coordination	a/	ls/yr	1	\$3,300	\$3,300
b. Analyticals: Metals+ Geochemical Parameters	p/	ea	30	\$350	\$10,500
c. Equipment Rental/Field Expenses	p/	ls	1	\$3,000	\$3,000
d. Monitoring Labor	q/	ea	1	\$11,600	\$11,600
e. Reporting		ls	1	\$5,000	\$5,000
Subtotal Annual Monitoring Costs					\$33,400
2. Contingency (20% of Annual Monitoring Costs)					\$6,680
Total Annual Monitoring Costs					\$40,100
Present Worth of Total Annual Monitoring Costs (Years 6-30) (Payment Years 7- 31)					\$311,400
TOTAL PRESENT WORTH COSTS					\$2,591,000

Notes:

- a/ Project management and coordinating all project related activities.
- b/ Assume sampling of 24 locations for predesign data
- c/ Assumes 3 phases of remedial design submittal to USEPA.
- d/ Present worth costs were estimated based on a net annual discount rate of 7%, assuming year-end distribution, rounded to the nearest \$100.
- e/ Assumes construction of a decon pad for equipment and a dewatering pad for impacted soils
- f/ Excavation of sediments and impacted soils from the Imhoff wetland that exceed ecological target risk.
- g/ Wetland restoration including backfilling imported material and planting/seeding.
- h/ assumes plantings in forested wetland at 1 tree per 30 sq. ft of disturbance
- i/ Load soils on trucks for transportation; handling of soils including transportation onsite and stockpiling.
- j/ Assumes decontamination water and dewatered water is non-hazardous.
- k/ Assumes confirmation soil sampling at 50'X50' grid (1 comp. Sample/grid) plus 6 QA/QC, 14 waste samples
- l/ Assumes toxicity testing for three species in 12 sampling locations
- m/ Assumes sludge/soil to be non-hazardous and hauled away and disposed at a local Subtitle D facility.
- n/ Labor and expenses to oversee and direct the excavation contractor, restoration contractor and collecting confirmation soil samples by a full-time personnel (assumed to take 20 weeks).
- o/ A removal action report will be submitted to EPA.
- p/ Assumes sampling of 6 sediment, 10 hydric soils, 10 surface water locations per event plus 4 QA/QC
- q/ Assumes equipment rental and expenses for sampling
 - Estimates are based on information currently available and on assumptions listed in this report.
 - Abbreviations: ea = each; ls = lump sum; hr = hours; cy = cubic yards; gal - gallons; yr = year
 - Total Costs are rounded to nearest \$10 and the present worth costs are rounded to nearest \$100.

Table 5-12
Opinion of Probable Costs for Capping of Hydric Soils in Imhoff Wetlands, Limited Removal of Sediments and Hydric Soils,
and Monitored Natural Recovery of Surface Water Option (Sediment, Hydric Soil, and Surface Water (Alternative SHSW3))

Record of Decision
Admiral Home Appliances Site
Williston, South Carolina

DESCRIPTION	NOTES	UNIT	QTY	UNIT COST (\$)	TOTAL COST (\$)
I. Design Services					
1. Project Management/Coordination	a/	ls	1	\$21,500	\$21,500
2. Predesign Data Collection /Additional Constructed Wetland Survey/Lab Eval.	b/	ls	1	\$50,000	\$50,000
3. Remedial Design Reports (30%, 70% & 100%)	c/	ls	1	\$125,000	\$125,000
4. Contract Documents/Construction Plans/Specifications/HASP		ls	1	\$15,000	\$15,000
5. Prebid Meeting, Contractor Selection/Contracting/Planning		ls	1	\$3,500	\$3,500
Subtotal Presdesign Services Costs					\$215,000
6. Contingency (20% of Predesign Services Costs)					\$43,000
Total Predesign Services Costs					\$258,000
Present Worth of Total Predesign Costs	d/				\$241,100
Payment Year 1					
II. Construction Costs					
1. Excavation and Off-Site Disposal of Hydric Soils and Sediments					
a. Mobilization/Demobilization		ls	1	\$10,000	\$10,000
b. Site Preparation/Staging Areas Setup	e/	ls	1	\$50,000	\$50,000
c. Excavation of Hydric Soils	f/	cy	1,750	\$100	\$175,000
d. Dewatering of Hydric Soils and Sediments		cy	1,750	\$10	\$17,500
e. Excavation of Sediments		cy	200	\$50	\$10,000
f. Forested wetland clearing		sf	48,000	\$3	\$144,000
g. Forested wetland backfill and restoration		cy	1,750	\$90	\$157,500
h. Stockpile Sampling & Analysis		ea	9	\$250	\$2,250
i. Transportation and Disposal of Excavated Material	g/	tons	2,700	\$55	\$148,500
j. Confirmation Sampling and Analysis	h/	ea	20	\$250	\$5,000
k. Confirmatory toxicity testing	m/	ea	12	\$2,200	\$26,400
l. Additional planting - trees and shrubs	i/	ea	1,600	\$25	\$40,000
m. Load (impacted hydric soils and sediments)		cy	1,950	\$3	\$5,850
n. Haul/Handling of Hydric Soils and Sediments/Staging (on-site)		cy	1,950	\$3	\$5,850
2. Capping of Impacted Hydric Soils		cy	1,300	\$50	\$65,000
3. Wetland Creation of Equivalent Value	j/	ls	1		\$350,000
Construction Services Costs					\$1,212,850
4. Contingency (20% of Construction Services Costs)					\$242,600
Total Construction Services Costs					\$1,455,450
Present Worth of Total Construction Costs	d/				\$1,360,200
(Payment Year 1)					
III. Construction Services					
1. Engineering/Construction Oversight (20% of subtotal excavation and capping costs)		ls	1	\$291,100	\$291,100
2. Construction Completion Report	k/	ls	1	\$5,000	\$5,000
3. Health and Safety Monitoring Instruments		ls	1	\$3,000	\$3,000
4. Project Management/Coordination		ls	1	\$33,200	\$33,200
Subtotal Construction Services Costs					\$332,300
5. Contingency (20% of Construction Services Costs)					\$66,460
Total Construction Services Costs					\$398,760
Present Worth Construction Services Costs	d/				\$348,300

III. Operation and Maintenance (O&M) Costs
Year 1 - 5 O&M

1. Semiannual Soil and Surface Water Monitoring (26 locations + QA/QC samples)					
a. Project Management/Coordination	a/	ls	1	\$8,244	\$8,200
b. Pre-field setup and mobilization		ea	2	\$1,000	\$2,000
c. Labor - Sampling of soil and surface water stations (semiannual)	l/	hr	2	\$11,600	\$23,200
d. Analyticals: Metals+ Geochemical Parameters	l/	ea	60	\$350	\$21,000
f. Equipment rental/expenses (semiannual)	n/	ea	2	\$1,500	\$3,000
g. Cap Maintenance		ls	1	\$5,000	\$5,000
h. Monitoring report to Agency (semiannual)		ls	2	\$10,000	\$20,000
Subtotal Annual O&M and Monitoring Cost					\$82,400
2. Contingency (20% of Annual O&M and Monitoring Costs)					\$16,500
Total Annual O&M and Monitoring Cost					\$98,900
3. Toxicity testing at end of year 1 and year 5	l/	ea	24	\$2,200	\$52,800
Total Annual Cost of Toxicity Testing					\$10,560
Total O&M and Monitoring Cost Annualized					\$109,460
Present Worth of Annual O&M and Monitoring (Year 2-5)					\$419,400
Payment Years 2 - 6					

Years 6 through 30 (Annual Natural Recovery Monitoring)

1. a. Project Management/Coordination	a/	ls/yr	1	\$3,200	\$3,200
b. Analyticals: Metals+ Geochemical Parameters	l/	ea	30	\$350	\$10,500
c. Equipment Rental/Field Expenses	n/	ls	1	\$1,500	\$1,500
d. Monitoring Labor (annual)	l/	hr/yr	1	\$11,600	\$11,600
e. Reporting (annual)		ls/yr	1	\$5,000	\$5,000
Subtotal Annual Monitoring Costs					\$31,800
2. Contingency (20% of Annual Monitoring Costs)					\$6,360
Total Annual Monitoring Costs					\$38,200
Present Worth of Total Annual Monitoring Costs (Years 6-30 Monitoring)					\$296,600
Payment Years 7-31					
TOTAL PRESENT WORTH COSTS					\$2,665,600

Notes:

- a/ Project management and coordinating all project related activities.
 - b/ Assume sampling of 24 locations for predesign data and proposed construction wetland evaluation
 - c/ Assumes 3 phases of remedial design submittal to USEPA.
 - d/ Present worth costs were estimated based on a net annual discount rate of 7%, assuming year-end distribution rounded to the nearest \$100.
 - e/ Assumes construction of a decon pad for equipment and a dewatering pad for excavated hydric soils and sediments
 - f/ Excavation of hydric soils and sediments from the Imhoff wetland that exceed ecological target risk.
 - g/ Assumes hydric soils and sediments to be non-hazardous and hauled away and disposed at a local Subtitle D facility.
 - h/ Assumes confirmation soil sampling at 50'X50' grid (1 comp. Sample/grid) plus 6 QA/QC
 - i/ Assumes plantings in forested wetland at 1 tree per 30 sq. ft of disturbance
 - j/ Assumes excavation of 1 acre 1 foot deep and restoration costs (\$350,000)
 - k/ A removal action report will be submitted to EPA.
 - l/ Assumes sampling of 26 locations per event plus 4 QA/QC
 - m/ Assumes toxicity testing for three species in 12 sampling locations
 - n/ Assumes equipment rental and expenses for sampling
- Costs are based on vendor information, contractors' estimate, cost estimation manuals, and past experience.
- Abbreviations: ea = each; ls = lump sum; hr = hours; cy = cubic yards; gal = gallons; yr = year

COST-EFFECTIVENESS MATRIX

Equalization Lagoon

<u>Alternative</u>	<u>Present Worth Cost</u>	<u>Long-Term Effectiveness and Permanence</u>	<u>Reduction In Toxicity, Mobility and Volume Through Treatment</u>	<u>Short-Term Effectiveness</u>
No Action S-1	\$66,800	No reduction in long-term risk	No reduction in toxicity, mobility, or volume	Continued risk
Capping and ICs S-3	\$91,500	Some residual risks remain	Some reduction in mobility, but not toxicity or volume	Controlled risk to workers and community
Excavation and Off-Site Disposal S-2	\$122,000	Reduces risk to acceptable levels	Reduction of toxicity, mobility will be achieved through stabilization if waste/soil is found to be hazardous. Volume will not be reduced.	Controlled risk to workers and community
Stabilization, Capping & ICs S-4	\$219,200	Some residual risks remain	Some reduction in mobility and toxicity, but not volume	Controlled risk to workers and community

Groundwater

<u>Alternative</u>	<u>Present Worth Cost</u>	<u>Long-Term Effectiveness and Permanence</u>	<u>Reduction In Toxicity, Mobility and Volume Through Treatment</u>	<u>Short-Term Effectiveness</u>
No Action GW-1	\$173,900	No reduction in long-term risk	No reduction in toxicity, mobility, or volume	Continued risk
MNA GW-2	\$1,373,200	Some residual risks remain; institutional controls required	No reduction in toxicity, mobility, or volume (except that which naturally occurs)	Controlled risk to workers and community
ERD with MNA GW-4	\$2,434,000	Lowest residual risk due to active treatment	Reduction of toxicity, mobility and volume achieved through treatment	Controlled risk to workers and community
Pump & Treat with MNA GW-3	\$5,496,700	Some reduction in residual risks	Reduction in toxicity, mobility, and volume achieved through treatment, but not as quickly as GW-4	Controlled risk to workers and community

Sediment, Hydric Soil, & Surface Water

<u>Alternative</u>	<u>Present Worth Cost</u>	<u>Long-Term Effectiveness and Permanence</u>	<u>Reduction In Toxicity, Mobility and Volume Through Treatment</u>	<u>Short-Term Effectiveness</u>
No Action SHSSW-1	\$140,600	No reduction in long-term risk	No reduction in toxicity, mobility, or volume	Continued risk
Removal and Off-site Disposal and MNA SHSSW-2	\$2,591,000	Minimal residual risk; full wetland restoration required	Reduction of toxicity, mobility will be achieved through stabilization if soil/sediment is found to be hazardous. Volume will not be reduced.	Controlled risk to workers and community; short term impacts on environment
Capping, Limited Removal, and MNA SHSSW-3	\$2,665,600	Some residual risk	Some reduction in mobility; toxicity and volume not affected	Controlled risk to workers and community

PART 4 REFERENCES

Accelerated Bioremediation of Chlorinated Compounds in Groundwater. Ed. Stephen Koenigsberg, Selected Battelle Conference Papers 1999-2000, Regenesi Bioremediation Products, 2000.

Accelerated Bioremediation Using Slow Release Compounds, Eds. Stephen S. Koenigsberg and Robert D. Norris, Selected Battelle Conference Papers: 1993-1999, Regenesi Bioremediation Products, 1999.

ATSDR 2000a. Toxicological profile for manganese. Agency for Toxic Substances and Disease Registry. US Public Health Service and Human Services. September.

ATSDR 2000b. Toxicological profile for chromium. Agency for Toxic Substances and Disease Registry. US Public Health Service and Human Services. September.

Carolina Geological Society, 1991. The Geology of the Carolinas. Eds J. Wright Horton, Jr., and Victor A. Zullo, Carolina Geological Society Fiftieth Anniversary Volume.

ENSR Corporation, Work Plan for Remedial Investigation/Feasibility Study, Admiral Home Appliances Site, E.P.A Id. No. SCD 047 563 614, Williston, South

ENSR Corporation, Admiral Home Appliances Remedial Investigation/Feasibility Study Phase 1A Summary Report and Proposed Phase 1B Investigation, June 5, 2002.

ENSR Corporation, Admiral Home Appliances Remedial Investigation/Feasibility Study Phase 1 Summary Report, February 20, 2003.

ENSR Corporation, Admiral Home Appliances Remedial Investigation/Feasibility Study Phase 2 Field Sampling and Analysis Plan, February 20, 2003.

ENSR Corporation, Admiral Home Appliances Remedial Investigation/Feasibility Study Treatability Study Work Plan, February 20, 2003.

ENSR Corporation, Admiral Home Appliances Site Draft Ecological Risk Assessment Steps 1 through 4, February 20, 2003.

ENSR Corporation, Admiral Home Appliances Site Phase 2 Progress Report, January 29, 2004.

South Carolina Department of Health and Environmental Control (SCDHEC), 1989. Admiral Home SSL.

South Water Carolina Resources Commission Report Number 155, Geology and Ground-Water Resources of Allendale, Bamberg, and Barnwell Counties and Part of Aiken County, South Carolina, 1989.

U.S. Department of Agriculture (USDA), 1977. Soil Survey of Barnwell County, South Carolina, Eastern Part. Soil Conservation Service. February 1977.

U.S. Environmental Protection Agency (USEPA), 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. Interim Final. Office of Emergency and Remedial Response, Washington, DC. EPA/540/6-89/004.

U.S. Environmental Protection Agency, Administrative Order by Consent for Remedial Investigation/Feasibility Study; Admiral Home Appliances Site, Barnwell County, Williston, South Carolina. September 25, 2000.

U.S. Environmental Protection Agency, Scope of Work for Remedial Investigation/Feasibility Study; Admiral Home Appliances Site, Barnwell County, Williston, South Carolina. September 25, 2000

USEPA, 2001. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM). USEPA Region 4, November 2001.

USEPA. 2002. Drinking Water Standards and Health Advisories. Summer 2002. Office of Water. EPA/822-B-00-001.

USEPA, 2001. Method for Collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analysis: Technical Manual. Oct 2001, EPA-823-B-01-002.

USEPA, 1989a. Protocols for Short Term Toxicity Screening of Hazardous Waste Sites. EPA/600/4-85/013.

USEPA, 1989b. Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference. EPA/600/3-89/013.

USEPA, 1997. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final, U.S. EPA Environmental Response Team, Edison, NJ, June 5, 1997.